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ORIGINAL COMMUNICATIONS.

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**REMARKS UPON THE TREATMENT OF GUN-SHOT
WOUNDS OF THE MASTOID.**

DR. HAROLD NEUHOF and DR. GERARD H. COCKS, New York City.

The treatment of gun-shot injuries of the mastoid varies widely, depending upon whether the case is encountered in the front area or at the base hospital; in other words, whether the patient is seen during the period of wound contamination or earliest infection, or whether he is treated after infection is definitely established.

Treatment at the front area. Before discussing some of the details of the treatment of mastoid wounds in the front area, that is, a short time after they have been inflicted, it may be well to describe the general picture presented. In some cases, unfortunately, the condition is hopeless from the outset. These are instances in which the mastoid is extensively shattered, with extensive laceration of the lateral sinus, dura and brain tissue, with much extrusion of the latter. At post-mortem examination of such cases, widespread damage to the brain is found, not only in the immediate vicinity of the wound, but on the opposite side of the brain as well. This picture is accompanied by radiating fracture of the skull.

It is erroneous to believe that these extensive injuries are produced only by a missile which penetrates into the cranial cavity, for we have seen not a few instances of extensive damage with laceration

*Read before the Section on Otology, New York Academy of Medicine, April 6, 1919.

of dura and brain as a result of tangential wounds. These patients died, for the most part, within 24 hours after admission to the hospital.

To digress for a moment, let us consider the less severe grades of brain injury, for these are the ones more commonly seen and in which possibilities of surgical relief exist.

The patient is usually admitted either in a condition of coma or semi-coma, or in a state of peculiar restless irritability. In some instances, the pulse is abnormally slow; in others, small and rapid. In the latter group, there is a less favorable prognosis. The entrance wound over the mastoid is not necessarily a large opening or one from which brain substance escapes, but may be of the small punctured type. Varying neurological manifestations of brain injury may be present, depending upon the direction taken by the missile, and upon the region of the brain tissue damaged by it. In the majority of cases we have seen, however, there have been no localizing signs of brain injury where the mastoid has been the site of entry.

It is impossible to gauge in advance, except in cases of gross and evident destruction of the mastoid, how extensive the bony damage may be. In one case, where the point of entry was directly over the base of the mastoid and produced a ragged wound of the soft parts, the bone damage was slight, required merely local excision of the mastoid, and the foreign body was found lodged behind the mastoid in a deeply depressed fracture. On the other hand, small penetrating wounds may produce extensive destruction of the mastoid, a tear of the lateral sinus, and widespread damage to the underlying brain.

The most serious problem in the treatment of wounds of the mastoid which lacerate the dura, is that of coping with infection, which is apt to develop because of the difficulties involved in making a complete excision of wounds situated in this region. In other parts of the skull, as, for example, the parietal region, free exposure can readily be obtained. This is not as feasible in the mastoid area, and consequently the point of entrance of the wound cannot always be thoroughly excised. Take for instance, a wound which damages the mastoid, and has its entry in the region of the auditory canal, either directly anterior or posterior to it. Manifestly such a wound cannot be as thoroughly excised as the ordinary penetrating wound of the skull.

Again, the treatment of the dural tear, in cases of penetrating wounds of the mastoid is a problem not capable of being handled

as easily as in the case of ordinary penetrating wounds of other parts of the skull. Oft-times the tear in the dura can only be partially exposed in the limited field. Moreover, not a few of these tears extend down toward the base. In this paper, we do not wish to discuss in detail the problem of the treatment of the dural tear, but it will suffice to say, that its full exposure is most desirable in order to remove in-driven fragments of bone and foreign material, such as bits of cloth. Thus it is evident that penetrating wounds of the mastoid involving the brain cannot be subjected to such a complete operation as the ordinary penetrating cerebral wounds, and that the mortality is, as a result, necessarily higher.

There is, in addition, the added complication of a tear of the lateral sinus in not a few cases. These tears vary from superficial ones in which much of the sinus wall is intact, to instances in which the sinus is completely torn across with the severed ends widely gaping.

Before describing the method we employed in treating sinus wounds, it may be well to state that it was necessary, from the viewpoint we held as to the primary closure of these wounds, that a technique be employed that did not involve any form of packing. In every instance, these wounds were closed primarily, even if plastic repair of the skin was required. In brief, the less severe degrees of sinus injury were treated by the applications of so-called "postage-stamp" grafts, in the following manner: a bit of normal fascia or muscle was removed from the region of the wound, after the latter had been excised, and placed over the bleeding sinus. Gentle pressure for a moment over this graft invariably controlled the bleeding, and there were no instances of recurrence of bleeding after operation.

We have already spoken of the difficulty of treating dural tears in the neighborhood of the mastoid region. In view of the communication of the mastoid cells with the naso-pharynx, via the middle ear and Eustachian tube, the necessity for closure of dural tears was thought to be very evident. If the dural laceration was too large to be sutured, transplantation of fascia lata into the dural defect was employed.

The following case is an example of a penetrating wound of dura and brain, and illustrates the method of treatment employed.

An infantry captain entered the hospital with a large gutter wound over the right mastoid region, from which brain substance was extruding. His condition alternated between drowsiness and extreme restlessness and it was impossible to obtain any history.

There were no paralyses. X-ray examination was negative for a foreign body.

At operation, shortly after admission to the hospital, the wound was excised. The opening in the bone was enlarged. The posterior portion of the mastoid was excised at the same time. There was a large epidural clot in which bone fragments were embedded. After its removal, active bleeding began from a tear in the lateral sinus, that had been sealed by the blood clot. Bleeding was controlled by gauze pressure until a small piece of temporal muscle was detached from the upper edge of the wound, applied over the tear in the sinus, and held in place with the gloved finger. Bleeding stopped promptly and did not recur.

Several large fragments of bone were driven into the brain. After their removal, there was an escape of ventricular fluid. The latter was also obtained by suction with a catheter, according to Cushing's technique. An extensive area of devitalized brain cortex with pulped hemorrhagic pia-arachnoid was excised, the torn cortical vessels being ligated. The margins of the torn dura were defined. Suture was impossible. Therefore a section of fascia lata 3x3 cm. was removed from the thigh and sutured into the dural defect. The mastoid cells were sealed off with bone wax. The scalp was closed by making a plastic flap.

The patient's mental condition showed progressive improvement after operation; the wound healed by first intention. Evacuated to the base on the eighth day. A follow-up report was received two months later stating that he was in good physical condition, the wound remaining healed. He reported being well one year after operation.

Where the injury of the sinus was more extensive, double ligation was practiced. It was found that by making small incisions in the dura immediately in front of and behind the sinus, an aneurysm needle could be passed around the vessel without difficulty. The cat-gut ligatures were then tied.

This procedure was employed in the following case:

A soldier entered the hospital, wounded by a shell explosion six hours before, and complaining of headache and dizziness. The shell fragment had penetrated the rim of his helmet. There was a ragged wound over the posterior portion of the base of the mastoid, in which blood clot presented. X-ray examination showed a small shell fragment lying in a depressed fracture of the skull. The wound was excised, a trephine opening made above the indriven fragments of bone, and the rim of the bone above and posteriorly

was rongeué away. The fragments of the bone were then carefully removed.

Active bleeding from the lacerated lateral sinus then began. This was controlled by pressure. The missile was found lodged in an epidural clot immediately behind the sinus and was removed. The dura was contused but otherwise intact. The tear in the sinus was a gaping one, involving about half its circumference. Evidently part of its wall had been carried away by the missile. An attempt to control the bleeding by a muscle graft failed. Therefore the sinus wall was exposed on both sides of the lesion, by small incisions through the dura immediately beyond its margins. The bleeding from the sinus was temporarily controlled by a small pledget of gauze pressed over the tear. An aneurysm needle armed with cat-gut was passed around the sinus, above and below the tear, through these small openings, and the ligatures tied. Bleeding stopped promptly. The fragmented portion of the mastoid was removed, the remaining cells being sealed off with bone wax. The wound was sutured and healed by primary union.

A word is necessary to explain the use of bone wax. This was used to avoid contamination of the wound from infection traveling up the Eustachian tube and middle ear through the mastoid cells that were still present. It was our practice, after excision of the wound in the soft parts and bone, to seal off the cells left behind with a thin layer of wax.

It may be stated, on the basis of follow-up reports in a few cases in which this procedure was employed, that complications referable to the use of bone wax for cell sealing did not develop, the wounds healing by primary union and remaining closed.

In regard to the treatment of the wound of the mastoid itself, in our own cases we were guided by the amount of damage present in the mastoid process. In some instances operation was not performed. Thus in one patient, there was a small, clean-looking wound over the mastoid, while marked vertigo, vomiting and nystagmus were present. X-ray examination showed a minute bit of metal deep in the mastoid. Unfortunately there was no time to make functional tests. After three days, vertigo and vomiting ceased, and nystagmus became much less pronounced. As the wound remained free from any signs of infection, the patient was evacuated to the base.

In a gun-shot wound of the mastoid, the removal of the bone, where the case was operated early (before wound infection was definitely established) was limited to the immediate region of the wound. The complete exenteration of all the mastoid cells did not

seem necessary. In a few instances where the lower portion of the mastoid was completely severed from the upper part, the lower fragment was removed *in toto*.

Treatment at the Base Hospital. A day or more necessarily elapses between the time the soldier is injured at the front and his arrival in the base hospital. He usually reaches the Evacuation Hospital (Casualty Clearing Station) within the first 24 hours, where the operative treatment described above is administered. By the time he is admitted to the base hospital, the wound is either healed by primary union or is definitely infected and suppurating.

In the former event the treatment is *nil*; in the latter, incision and drainage with mastoidectomy are promptly instituted. In two instances mentioned below, it was necessary to completely extirpate the mastoid cells, which were softened, broken down and filled with pus.

The Base Hospital surgeon should bear in mind the possibility that one or more foreign bodies may have been overlooked during the original operation at the Casualty Clearing Station. Therefore a second X-ray should be taken. The field medical card notes and radiograph, made during the stress of a drive at the front, have possibilities of error that should be borne in mind.

In our service Carrel-Dakin treatment was used and found by far the most satisfactory technique.

The following two case reports are examples of infected suppurating mastoid wounds, such as are seen at the Base Hospital. In one, the foreign body had been removed at the Casualty Clearing Station, in the other the foreign body was still *in situ*.

(1) Private C., 25 years old, was struck in two places on the head, on the afternoon of December 4, 1917. He thinks the missiles were bullets. One wound was in the region of the right mastoid, the other over the right side of the face.

He was taken to a Casualty Clearing Station the following morning. The note made on his field medical card was that a bullet had been extracted from the right antrum by Ferguson's route. That was all the information we had regarding this patient on arrival at No. 1 General Hospital, B. E. F., December 12, 1917.

He said he did not lose consciousness when he was struck, so far as he knows; that he suffered some pain, although not much.

On examination we found a wound about $1\frac{1}{4}$ inches long, over the tip of the right mastoid process. This had been sutured. The wound looked a little red on wiping over it with cotton. I expressed

a small amount of pus from under the skin, removed the sutures and on probing wound, found some loose bone in the tip of the mastoid.

The wound of the face ran from just below the external angular process in an irregular direction toward the nose; then down along-side of the nose to the lip. This wound had been sutured. The old incision through the anterior wall of antrum was visible under the lip and there was pus in the right nostril.

December 12 it was decided to operate both the mastoid wound and the maxillary antrum. The usual retro-auricular mastoid incision was made. The mastoid was of the cellular type, very much congested and inflamed, with a small amount of pus present. All the mastoid cells were exenterated. The shell fragment or bullet had shot away the tip of the mastoid and lower part of posterior bony canal wall. No foreign body was found in the wound and presumably had been removed at the Casualty Clearing Station. The sinus and dura were uninjured. Wound packed with Dakin gauze and the mastoid operation concluded with usual dressings.

The original incision through the anterior wall of the maxillary antrum was opened, the antrum found full of blood and packed with gauze. This was allowed to remain in place for 48 hours.

Two days later (December 14) the cheek wound broke down. Two stitches in the lower angle were removed, the infected area and antrum washed out daily with Dakin solution, and the antrum flushed at frequent intervals through Carrel-Dakin tubes using boric acid instead of Dakin solution, as the latter proved too irritating.

On January 6 the mastoid wound was covered with bright red healthy granulations, the antral suppuration had ceased, and the wound of the face healed. The patient was then evacuated to England.

(2) Private C.—Two weeks before was struck by fragment from a bursting shell, and received wound in upper part of auricle. Did not lose consciousness and had no cerebral symptoms.

Admitted to No. 1 General Hospital, B. E. F., November 19, 1917, looking ill and with a temperature of 102° . Wound in auricle which ran directly to bone, and discharging pus profusely.

Capt. Casamajor, our neurologist, could find no symptoms pointing to intracranial involvement. Reflexes normal; no nystagmus.

With a probe through the wound in the auricle we could detect something sharp which gave the impression of being a metallic foreign body. Stereoscopic X-ray, lateral view, showed foreign body in skull, apparently in mastoid process or just behind and below it.

Examination of the middle ear showed a congested drum; there was no bulging.

Operation. November 21. Retro-auricular incision and exposure of the tract of the missile. There was a V-shaped defect in the posterior bony canal wall, which was made by the shell fragment in its course inward. There was a defect in the mastoid process where the fragment had struck the mastoid bone just back of posterior canal wall, but after its passage through the mastoid it was no longer possible to follow the tract made in the bone. The whole mastoid was hemorrhagic and softened, and it was necessary to perform a simple mastoidectomy. The descending limb of the sinus was exposed for a small area and was normal.

In removing some soft mastoid cells over the mastoid antrum, a fairly large piece of bone came away with the curette, exposing the dura of the middle fossa. At this point there was a small defect in the dura from which pus escaped. At the time it was thought that this may have been the point of entry of the foreign body into the cranial cavity. With an aspirating needle and syringe, we aspirated what appeared to be broken down brain tissue but no more pus. I enlarged the opening in the dura, incised the brain with a knife, and introduced a finger into the cavity in the brain. No foreign body could be felt.

In spite of this it was deemed best to conclude the operation without further efforts to locate the foreign body, as it was felt that the shell fragment might be lodged in an inaccessible locality in the cranial cavity. Cigarette drain was introduced into the small abscess cavity in the brain and the mastoid wound packed with Dakin gauze.

Four days later, November 23, when the temperature was 102.4°, I removed the packing from mastoid wound with intention of putting in fresh tubes. When the gauze drains were taken out, in the lower part of the mastoid down toward the tip, just in front of the descending limb of the sinus, was a small opening, from which large quantities of pus oozed. As the pus was wiped away, it continued to flow out in large amounts.

Consultation with Col. Darrach, who suggested enlarging this opening and going after the foreign body. A new set of X-ray plates taken by Lieut. Hobbs showed one large foreign body and a smaller one adjoining it at the base of the skull, probably lodged in the occipital bone near the atlas.

Operation. Same day, November 23. Enlarged opening in the mastoid, from which pus was oozing; then made an incision from

the lower angle of the mastoid wound, in a downward and backward direction, down to the muscles. With a long artery clamp, made an opening toward the base of the skull in the direction of the foreign body, where softened bone could be felt. This was apparently in the occipital bone not far from the atlas or foramen magnum. Both the large and small foreign bodies were removed with a long artery clamp.

Dakin tube and one strip of gauze inserted in wound in occipital region. Opening into mastoid packed off with Dakin gauze. One small Carrel tube placed in abscess cavity in temporal lobe and two other tubes placed in the mastoid wound.

Note. The tract of the foreign bodies was apparently through the upper part of the auricle, through the posterior bony canal wall down through the mastoid, where it passed just in front of the descending limb of the sinus. From there it apparently went around the base of the skull, where it lodged in the occipital bone not far from the foramen magnum. The most probable way to account for the tear in the dura and the abscess in the temporal lobe is by an injury of the dura by a splinter when the bullet traversed the mastoid.

This man died January 22, 1918, following an amputation of the arm for septic elbow joint associated with an acute osteomyelitis.

In conclusion, we may summarize our experiences as follows:

The method of treating gun-shot wounds of the mastoid depends upon whether the patient is operated early, before the onset of wound contamination or definite infection, or whether he is first seen after the wound is suppurating.

1. *Operation in the first stage, before wound infection, embraces—*

- (a) Excision of the wound.
- (b) Removal of indriven bone fragments and foreign bodies, and damaged portions of the mastoid.
- (c) Closure of the dural tear by suture or by fascial transplant.
- (d) Primary closure of the wound.

The complication of laceration of the lateral sinus is treated by "postage-stamp" graft or ligation of the sinus, depending upon its extent. Larger lacerations of the sinus are treated by double ligation according to the method described in the text.

2. *Treatment at the base, after wound infection, includes—*

- (a) X-ray for additional foreign bodies.
- (b) Incision and drainage of the bone wound, with complete exenteration of the mastoid cells.
- (c) Employment of Carrel-Dakin technique.

INJURIES OF THE NOSE AND THROAT, DUE TO BULLET AND SHELL WOUNDS.

DR. J. M. INGERSOLL, Cleveland, Ohio.

The division of Head Surgery in the Surgeon General's Office was under the direction of Colonel W. R. Parker. The Oto-Laryngological Section of this division was under the supervision of Lt. Col. H. P. Mosher. The Section of Defects of Hearing and Speech was under the direction of Col. C. W. Richardson. The constant interest of these men and their wise direction contributed much to the success of the work of the Oto-Laryngological Department.

In January, 1918, the Medical Department of the Army leased a modern fire-proof hotel at Cape May, N. J., and converted it into a hospital. In the army it was known as the U. S. A. General Hospital, No. 11, or the Hospital for Head Surgery. As fast as it could be secured the necessary equipment was installed in the hospital.

The work in the hospital was divided into the Section of Brain Surgery and Peripheral Nerve Injuries, the Ophthalmological Section, the Oro-Plastic Section, and the Section of Oto-Laryngology.

Practically all of the cases of war wounds of the head were of such a nature that their treatment necessitated work in two or more of the various departments, so that nearly all of the cases were seen in consultation and treated by the various departments. In all of the departments of the hospital there was a most cordial spirit of co-operation and team work, which added materially to the efficiency and interest in the work.

Associated with me in the Oto-Laryngological Department were the following men: Capt. Gordon Berry, Capt. H. F. Lampe, First Lieut. F. N. Bigelow, First Lieut. E. P. Longaker, First Lieut. H. J. Beard. Capt. H. P. Cahill was also a member of the Oto-Laryngological staff until August 10th, when he was assigned to Unit 115, and went to France. These men are all capable and well trained, and our work together was a constant source of pleasure to all of us.

On April 1, 1918, twenty-six cases were transferred to the Oto-Laryngological Department, and from this time the number of patients in the department constantly increased. On July 1, 1918,



Plastic Operation. A flap was taken from the forehead and turned down so as to lower the eyelid and bring it into normal position and restore the bridge of the nose.



High explosive shell fragment destroyed bridge of nose and right eye. This soldier said that his injury was received when the first break was made in the Hindenburg line. His brigade had advanced beyond their objective and were caught in their own barrage. During the hand to hand fighting he received a bayonet thrust through the left coat sleeve which just missed the elbow. When the shell fragment struck him he was stunned temporarily. Vision in the right eye was destroyed and the left eye was closed by swelling, so that he was totally blind for several days. He laid in a shell hole for three days before he was discovered and taken back to the first aid station.

the first patients from overseas were received. The number of overseas patients increased rapidly, and the average number of patients in the Oto-Laryngological Department varied between one hundred and one hundred and fifty.

The injuries to the nose and accessory sinuses and the surrounding tissues varied greatly in extent and character. In a number of cases a portion of the bridge of the nose high up, about on a level with the eyes, had been destroyed by machine gun bullets, leaving a depression which often involved the frontal sinuses. In one case both eyes had been destroyed and the anterior lobes of the brain exposed. In a few cases one eye had been destroyed. In three cases both eyes escaped with normal, or nearly normal, vision remaining. In several cases machine gun bullets had passed diagonally through one eye and the nose and mouth and out through the opposite side of the neck. As is usual in such cases the lesion at the point of entrance of the bullet was comparatively small, but at the point of exit the tissues were badly torn, leaving a large irregular scar. In all of these cases plastic operations were done to remove the scar tissue and remedy the deformities.

Pieces of shrapnel and high explosive shell were found in all portions of the head and face and neck. Shell fragments were found in all of the accessory cavities, more frequently in the maxillary sinus than in any other single place. These fragments usually entered through the cheek and a fistula persisted in the cheek until the maxillary sinus was opened and curetted and free drainage established into the nose. All of these cases were operated through the canine fossa and as soon as the maxillary sinus was cleaned up and drainage established the fistula through the cheek healed, leaving a depressed scar which was later removed by a plastic operation. There were a number of cases in which a bullet or fragments of shell passed through one maxillary sinus, then through both nasal fossae and the opposite maxillary sinus and out through the cheek. In several of these cases, the communications between the sinuses and the nasal fossae, made by the shell fragments or bullet, remained open and thus established free drainage into the nose. In all of the cases in which the nose and the sinuses were injured there were, of course, numerous adhesions which were separated in the usual way.

One patient, an officer, was struck in the right cheek by a piece of high explosive shell about one centimeter square. The shell fragment entered a little below the external canthus of the right eye, passed under the orbit, through the posterior ethmoidal cells and lodged in the septum between the sphenoidal cavities. Follow-



High explosive shell fragment passed through brim of helmet, left eye and lodged in left maxillary sinus. Three small pieces lodged in the left ethmoidal region. One fair size piece passed through the nose and lodged in the right maxillary sinus. Foreign bodies in maxillary sinuses removed through canine fossa and free nasal drainage established. Plastic operation to restore eyelid.



Machine gun bullet passed through right eye, right ethmoidal and maxillary sinus, hard palate and out through the left side of the neck, about five centimeters below the level of the auditory canal. Radical operation on right maxillary sinus to remove foreign bodies and establish free nasal drainage. Plastic operation to restore eyelids.

ing the injury the sight in the right eye was somewhat impaired, but gradually returned to normal. There were no signs of any infection in the sphenoidal sinuses, and the visual fields remained normal. He was kept under observation for two months, but in as much as the foreign body in the sphenoid was causing no symptoms he decided against an operation for its removal. There were a number of cases in which the radiographs showed small shell fragments in the ethmoidal cells which were causing no symptoms, and so were left in position.

We saw a number of cases in which the principal injury was confined to the tip of the nose. In some of these cases only one side of the nose was injured, while in others there was considerable destruction of the soft tissues at the end of the nose. There were also a few cases in which practically the whole nose had been destroyed.

The cases in which the soft structures had been only partially destroyed were remedied by flaps turned in from the cheeks to replace the lost tissue. In those cases in which the whole nose had been destroyed the typical Indian flap operation was done, turning down a flap from the forehead. In some of these cases a portion of a rib, consisting of both cartilage and bone, was implanted in the tissue of the forehead about ten days before the flap operation was done. The transplanted bone and cartilage was placed in such a position that it would form the bridge of the nose when the flap was brought down into its new position.

Most of these major operations were done by Col. V. P. Blair, who had charge of all of the Oro-Plastic work in this country. Col. Blair told us that all of the problems in plastic surgery could be solved by three simple principles. Removal of all the scar tissue; determination of the amount of healthy tissue necessary to cover the denuded area, and then by means of a well nourished flap carry the healthy tissue over the denuded area. We found, however, that the execution of these principles was not always a simple matter. In the majority of cases, however, the plastic operations were successful, and the unsightly scars and deformities were removed.

The wounds involving the jaw and the teeth often involved the floor of the nose also. The work done by the Dental Department for these jaw cases was of the highest type and the skill of the men in this department in restoring these injured jaws to their normal position and contour was admired by all of the staff. The defects in the lips and face and palate were remedied by plastic operations.



High explosive shell fragment entered the larynx through the left side, followed by infection of the superficial tissues and necrosis of the thyroid cartilage. Pieces of the shell passed directly through larynx and lodged in the soft tissue on the right side and were later removed. Small fistula at point of entrance, leading directly into the larynx. Both vocal cords and the intralaryngeal structures were badly torn. X-ray shows two small metallic fragments remaining in the soft tissue right side of neck and one fragment between the spinal cord and the transverse process of the third cervical vertebra.



High explosive shell passed through right cheek and lodged in the right maxillary sinus. The lower wound in the cheek was caused by a bullet which lodged in the tissue just below the external angle of the jaw. A fistula through the upper wound into the sinus persisted until the foreign body was removed and nasal drainage established. Plastic operation for removal of scars.

In a general way the plastic work was under the direction of the Oro-Plastic Section, but the plastic operations on the eyes were done with the co-operation of the Ophthalmological Section; those involving the mouth and jaws with the Dental Department, and those involving the nose and throat with the Oto-Laryngological Department, so that all of the Sections had the opportunity of doing, or assisting in, the plastic work.

The laryngeal cases were in some respects the most difficult type of cases which we had to treat. There were a few cases in which the bullets or shell fragments destroyed only the superficial tissue along the side of the larynx, causing complete paralysis on the affected side. These cases healed promptly, if the cartilage was not involved, and with the exception of a somewhat husky voice returned to civil life with practically no handicap. In those cases in which the shell fragments, or bullets, passed through the neck, the laryngeal cartilages and intra-laryngeal structures were more or less extensively destroyed, and adhesions formed causing laryngeal strictures, which necessitated a tracheotomy in nearly every case. Laryngeal fistulae existed in nearly all of these cases, and these fistulae failed to heal until all of the metallic fragments and all the necrotic tissue were removed and very free drainage established and even then they healed very slowly. The laryngeal obstruction, caused by the deformity and adhesions, was difficult to relieve, but in most cases persistent dilatation accompanied by, what Dr. Chevalier Jackson calls, the orthopedic treatment, eventually enabled us to remove the tracheotomy tube. The voice in these cases was much impaired, but in no case was it entirely destroyed. Dr. Jackson visited the hospital twice and saw these cases with us and gave us many valuable suggestions as to their treatment. The orthopedic treatment of stenosis of the larynx consisted in partially closing the tracheotomy tube with a cork and in this way inducing laryngeal respiration. The size of the cork was gradually increased so as to eventually cut off respiration through the tube and the normal respiratory action of the laryngeal structures was thus encouraged and the lumen of the larynx increased.

In one case a machine gun bullet entered the left side of the neck about two centimeters below the left auricle, passed through the pharyngeal wall and the base of the tongue, and out through the right side of the neck about six centimeters below the right auricle. There was a distinct bruit on the left side of the neck over the carotid artery with pulsation externally and also along the lateral pharyngeal wall. The bullet had evidently injured and weakened the wall of the carotid and thus caused an aneurism.



Gun Shot Wound. In addition to the injury of the upper lip, the superior maxilla was fractured and seven teeth lost. Plastic operation, flap from cheek to replace loss of tissue in the lip.



In the Argonne Sector. Shrapnel wound in right leg. Toul Sector. Hand grenade wound left hand, left arm, left side of chest and neck. High explosive shell burst in the air and fragments struck him on the right cheek and right side of nose. Flap from forehead turned down to repair defect at tip of nose.



Cantigny. Hit by two machine gun bullets and three shell fragments. One bullet passed through left frontal sinus and then down and out through the right mastoid. The second bullet lodged in the left orbit. The right auricle was partially severed by a shell fragment. Plastic operation for scar over left frontal sinus and scar and deformity around right eye. The right auditory canal was not injured and the drum membrane was intact. The hearing in the right ear was destroyed.

Another laryngeal case, in which there was a fistula, coughed up and expectorated a shell fragment about two weeks after he had received the injury. Evidently this piece had perforated the larynx and had then been inspired and later expelled by coughing. This happened before he came under our observation.

We saw a few cases in which shell fragments were encapsulated in the lung tissue, and were causing no symptoms, but we had no cases in which there were any shell fragments lodged in the bronchi, which could be removed with the bronchoscope.

Col. C. W. Richardson secured for the Section of Defects of Hearing and Speech, eleven of the most capable teachers that could be found in this country. In the cases of injury to the jaw, pharynx and larynx the instruction and vocal exercises which these teachers gave to the patients were exceedingly beneficial in re-establishing the vocal functions and stimulating the injured muscles. The skill in lip reading which the deaf patients acquired under the instruction of these teachers was remarkable, and the whole work of the Section of Defects of Hearing and Speech was most gratifying and pleasing to all of us.

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FOREIGN BODIES IN THE AIR AND UPPER FOOD PASSAGES IN PRE-ENDOSCOPIC DAYS.*

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We are all so familiar with what each of our contemporaries has done in this particular field, at least up to the date of our last meeting, that it would be a work of supererogation to follow in detail the progressive evolution of peroral endoscopy.

It may be of interest, if nothing more, to review as far as I have traced it in the older literature, the natural clinical history of foreign bodies in the air and upper food passages during the dark ages, before the effulgent radiance of the endoscopic light had been thrown on them.

As a postscript to his presidential address at the first meeting of the American Laryngological Association, in 1879, Louis Elsberg attempted the task of tabulating American rhino-laryngological and borderland literature from 1809 to that date. It is to this tabulation that I am indebted for the clues to most of my references, though it was impossible to verify some of his data. The preparation of this paper has been a very interesting occupation to me, and I believe that the case reports would prove equally so to anyone who troubled to look them up.

Possibly some of you have assumed, as I have, that the old mortality of inhaled and swallowed (and halted) foreign bodies was practically 100 per cent, and that there had been, in bygone times, little or no planned action for their removal. I was surprised to learn that in 1717 Verdun had done a "bronchotomy" for foreign body in the trachea.

In 1854, years before the laryngoscope had come into general practical use, Gross published an exhaustive work on this subject, which even now will repay careful study. In 1860, Horace Green, who was really the Father of American Laryngology, wrote a paper on "The difficulty and advantage of catheterism of the air passages in diseases of the chest," embodying the work of several years and reporting on 106 cases treated.

Two years previously, Bennet, professor of clinical surgery in the University of Edinburgh, doubtless inspired by Greene's earlier reports, described the introduction of a catheter into the bronchi of 7 patients in one of whom he "injected the lung" 11 times, starting

*President's address before the Annual Meeting of the American Association of Peroral Endoscopists.

with two drachms of a 30 grain to the ounce solution of silver nitrate and reaching half an ounce of a 40 grain solution; operator, treatment and patient all heroic! This was the precursor of our present methods of endoscopic medication and certainly speaks well for the courage of these pioneers.

I have culled from a large number of reports over 160 instances which typify the usual clinical histories and outcomes in pre-endoscopic days, and have endeavored to summarize them so that they may portray the practice of our forefathers. The instances of foreign body in the air passages numbered 137; in the esophagus there were 23 and 2 lye strictures; in the pharynx and naso-pharynx 4; indeterminate 1. The character of the intruding material was as follows: Fruit seeds and pits, 23; beans and grains of coffee and corn, 34; one single peanut was noted—its history was unusual; nut shells, 13; one piece each of cocoanut, apple and raw sweet potato; heads of grass, gone to seed, 2; needles and pins, 12 (no safety pins); buttons, 4; coins, 9; pipstems, 2; bones, 14; masses of meat, 3; one whole fish; a piece of sponge; stones and gravel, 5; lead pencil, 1; slate pencil, 1; metal articles, 10; charcoal, 1; cockle burrs, 5; pine burr, 1; teeth, 2; tooth plates, 4; thimbles, 2; fish hook, 1; air-gun darts, 2; a piece of thread, a glass bead, a match, a piece of wood, a piece of oyster shell, a broken tracheotomy tube.

The fatalities were as follows:

Case 8b. Age 2 years. Foreign body—Grain of wheat in ventricle of larynx for 7 months; no treatment. Autopsy.

Case 13. Age 2 years. Foreign body—Grain of coffee, 2 inches below bifurcation for three days; marked reaction. Autopsy.

Case 14. Age 1 year. Foreign body—Watermelon seed, 19 days, tracheotomy; not found; death on 21st day. Autopsy.

Case 21. Age 9 years. Foreign body—Beef bone; no treatment; perforation posterior wall of larynx. Autopsy.

Case 25. Age 4 years. Foreign body—Sponge the size of a white bean; tracheotomy; partial removal. Autopsy.

Case 31. Age 18 months. Foreign body—Coffee bean; 3 years 5 months; no treatment; coffee unchanged. Autopsy.

Case 54. Age 3 years. Foreign body—Orange seed; 36 hours; no treatment; sudden death. Autopsy.

Case 55. Age 7 years. Foreign body—Pine burr; 48 hours; no treatment; sudden death. Autopsy.

Case 65. Age 10 months. Foreign body—Six coil brass spring, 7/8x5/12 inches; no treatment; embedded at bifurcation. Autopsy.

Case 66. Woman. Foreign body—Brass tipped umbrella rib 1 1/4 inches; coughed up after 23 years; death 4 days later; tuberculosis. Autopsy.

Case 71. Child. Foreign body—White bean, "so swollen as to fill trachea"; death during tracheotomy.

Case 79. Age 4½ years. Foreign body—Sugared corn; 6 weeks; "occluding left bronchus." Autopsy.

Case 90. Age 67 years. Foreign body—Bone in right bronchus; no treatment. Autopsy.

Case 108. Age 4½ years. Foreign body—Lye stricture of esophagus; 2 years; bouginage; death in 5 days; "a firm band 1¼ inches above cardia." Autopsy.

Case 106. Age 4½ years. Foreign body—Bean in trachea; no treatment. Autopsy.

Case 109. Age 58 years. Foreign body—Bone perforating esophagus and vena cava; no treatment. Autopsy.

Case 110. Age 36 years. Foreign body—Bone perforating esophagus 1x½ inches; probang; peri-esophageal abscess. Autopsy.

Case 114. Woman. Foreign body—False teeth perforating esophagus; no treatment. Autopsy.

Case 126. Age 1 year. Foreign body—Match; 5 hours; child had perussis; head of match dissolved?; tracheotomy; removal.

Case 135. Age 2 years. Foreign body—Hickory nut shell in larynx 7 hours; dead on doctor's arrival. Autopsy.

Case 137. Age 9 months. Foreign body—Uncooked popcorn; 8 days; no treatment. Autopsy.

Case 148. Man. Foreign body—Head of timothy grass; stalk coughed up in 8 days from bronchus; "grass seed throughout lung." Autopsy.

Case 151. Boy. Foreign body—Tooth in bronchus; no treatment. Autopsy.

This gives the surprisingly small total of 22 deaths in 160 foreign body cases and includes one from stricture of the esophagus; only 13¾ per cent! Treatment had been attempted in six patients, unsuccessfully. It is noteworthy that our predecessors obtained 19 autopsies in these 22 cases, a far larger proportion than we are able to secure.

In 41 instances the foreign body was spontaneously coughed up at dates varying from a few hours to sixty years after its reception, 25.62 per cent. Among the most striking are:

Case 7. Age 9 years. Foreign body—A pencil 1x6/10 inches; 6 months. Recovery.

Case 8c. Adult. Foreign body—Nut shell; 7 years in larynx. Recovery.

Case 12. A physician. Foreign body—3 teeth on plate, after 46 days ejected with 1½ pints of pus. Recovery.

Case 16. Age 3½ years. Foreign body—Bone ¾x¼x1/12 inches coughed up after 60 years, with pus and blood. Recovery.

Case 20. Age 11 years. Foreign body—Cockspur coughed up after 3 years; "hard and unchanged." Recovery.

Case 26. Age 6 years. Foreign body—Filbert shell $4/10 \times 3/10 \times 1/10$ inches; 4 years 2 months. Recovery.

Case 56. Age 18 months. Foreign body—Squash seed; after 11 months. Recovery.

Case 62. Man. Foreign body—Piece of chestnut shell; after 6 years; unchanged. Recovery.

Case 66. Woman. Foreign body—Brass tipped umbrella rib; after 23 years; 4 days afterward died T. B.

Case 67. Age 7 years. Foreign body—Head of timothy grass $1 \times 3/8$ inches; 23 months; contrast with Case 148. Recovery.

Case 102. Age 60 years. Foreign body—Broken knife blade $1 \times 3/8$ inches; 12 years before the patient was stabbed below the scapula; the wound healed kindly and the occurrence was forgotten. In the interval he had coughed a great deal with profuse purulent expectoration. Recovery.

Case 108. Age 14 months. Foreign body—Shawl pin 2 inches long; 4 years. Recovery.

Case 111. Age 65 years. Foreign body—Set of teeth $2 1/8 \times 1 3/8$ inches; 15 months. Recovery.

Case 120. Age $4 1/2$ years. Foreign body—A kidney bean, in fragments between 17-20 days. Recovery.

Case 136. Woman. Foreign body—Shirt button transfixd by pin; button coughed up "in a few weeks"; pin coughed up "in a few months." Recovery.

Case 138. Age 15 months. Foreign body—Peanut; coughed up in 12 weeks. Recovery.

Case 141. Age 26 months. Foreign body—Hickory nut shell $7/16 \times 5/16$ inches; coughed up in 13 years, 3 months, 17 days. Recovery.

There was a very interesting series of tracheotomies, or as this procedure was then called, "bronchotomies" immediately or remotely after which the foreign body was expelled through the wound or displaced into the mouth, swallowed and passed by the bowel.

Immediate expulsion, 34; delayed expulsion, 18; total, 52, or $32 1/2$ per cent of all cases. In a few instances of multiple foreign bodies, their expulsion occurred at various times: of two melon seeds one was ejected immediately, the other 10 days later; of three melon seeds two were expelled at once and the third in a week. Several foreign body subjects were described as having "symptoms of worms."

There were 48 successful planned extractions from the pharynx, larynx, trachea, bronchi and esophagus, i. e., 30 per cent of all cases, which, with the post-tracheotomic cough-ups, gives a total of $62 1/2$ per cent of operative cures.

The extractions from the trachea and bronchi were, after tracheotomies, by forceps, probes, hooks and occasionally by an instrument improvised for the particular case.

Case 10. Age 8 years. Foreign body—Pin in larynx; ½ hour; a slight protrusion was felt on the anterior surface of the larynx; a small incision exposed the point, which was withdrawn and the head freed by slightly enlarging the cut.

Case 68. Foreign body—A man having inhaled a threaded tailor's needle was managed in the same way;

Case 143. As was a third patient 25 years of age.

Case 88. Woman. Foreign body—Shawl pin, glass head; after a tracheotomy the point was forced through the skin and broken off; the head was then grasped by forceps within the trachea and brought out.

Case 97. Foreign body—A ¾ inch shawl pin was removed after tracheotomy from a patient 8 years old;

Case 99. As was also one measuring 1½ inches with glass head from a 28 months old child.

Case 158. Foreign body—A pin was removed by forceps under control of the laryngoscope, from the larynx of a patient 28 years of age, having been in situ 3 hours, by Dr. Thos. R. French. Two cockle burrs were extracted from the larynx by forceps guided by the finger. (28 41). Two cockle burrs were pushed up into the mouth and thence extracted after thyrotomy. (69 70).

Case 112. Foreign body—A piece of thread was withdrawn from the larynx by means of a laryngeal brush which had been dipped in muciilage.

Case 134. Foreign body—A boy of 14 inhaled a toy locomotive; an immediate tracheotomy was done and 4 months later it was removed by thyrotomy.

Case 58. Foreign body—A child of 7 inhaled a pipestem 1 5/16 inches, which lodged in the right bronchus; after tracheotomy it was removed by a wire loop passed below it.

Of the esophageal foreign bodies, a large piece of meat was brought up by kneading the esophagus, three were dislodged by posture and pounding on the back, three by mechanically or medicinally produced emesis, four by the bristle or sponge probang; one, after numerous unsuccessful attempts with the probang, was removed by means of a doubled, bent wire running through a web catheter, two by external esophagotomy, one by a "floating hook" on a whale bone stem. When this patient was presented at a meeting of the New York Academy of Medicine, several of the audience emphasized the dangerous possibilities of an instrument of this kind.

Attempted extraction by the probang was followed by death from peri-esophageal abscess and several patients died without interference, from perforation.

A few cases of lye stricture were treated with rather indifferent results. 23 cases gave a total recovery of 19—82.61 per cent.

Of course, in the light of our present knowledge, this series is not a fair presentation of the clinical history of foreign bodies, even

in those times. Our own experience shows us how frequently they may be unconsciously inhaled, forgotten and their subsequent effects be attributed to a great variety of other causes.

We must, however, admire the resourcefulness of our professional ancestors in dealing with this class of cases and their success, considering their handicap by reason of their lack of our precise methods of diagnosis and modern armamentarium. Therefore, let us not boast too proudly of our present prowess.

170 Clinton Street.

THROMBOSIS OF THE INTERNAL JUGULAR VEIN WITH PYEMIA AS A COMPLICATION OF RETRO- PHARYNGEAL ABSCESS.

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The patient was a young man, 26 years old, who had given for three weeks the typical signs and symptoms of pyemia such as are seen in cases of thrombosis of the lateral sinus. The retro-pharyngeal abscess was of four weeks' standing and was successfully drained; but the swelling of the neck increased and the chills and the septic temperatures continued. It was decided to explore the neck for pus and to determine the condition of the internal jugular vein. Four ounces of foul pus were evacuated from the posterior portion of the carotid sheath. The internal jugular vein was found to be thrombosed and about two inches of the vein had sloughed away.

The operation confirmed the diagnosis. The patient died on the table.

This is the first case of its kind of which the writer has knowledge. It means that when a peritonsillar abscess or retropharyngeal abscess is complicated by pyemia, the pus which has accumulated in the pharyngo-maxillary fossa, through which the carotid sheath runs, has infected the internal jugular vein and started or produced a thrombus in it. When such a complication shows itself the operation that is indicated is to evacuate the pus from the carotid sheath and to tie or to dissect out the internal jugular vein.

The oto-laryngologist is thus called upon to make a new diagnosis and to widen the scope of an old operation. Oto-laryngologists have but to think back to recall cases which, as far as signs and symptoms go, fit in with the one just recorded.

828 Beacon Street.

| DATE | NO. | REPORTER | PUBLICATION | AGE | FOREIGN BODY | LOCAL DURATION |
|------|-----|------------|---|---------|--|---|
| 1820 | 1 | Duchateau | N. Y. Med. Reporter, p. 79 | 6½ | Pium pit 9x4½x2½ lines | Trachea |
| 1824 | 2 | Janson | Am. Med. Record, p. 76 | 11 | Pebble | 6 weeks |
| | 3 | Palmer | Phila. Med. Rec., p. 32 | 20 mos. | Bean | 2 hours |
| 1826 | 4 | Atlee | Am. Med. Rev., Phila., p. 191 | 10 yrs. | Button mold | ? |
| 1827 | 5 | Barnes | N. Y. Med. & Phys. Jour., p. 78 | 17 mos. | Shrunk beans and gravel | 58 days |
| | 6 | Barnes | N. Y. Med. & Phys. Jour., p. 78 | 2 yrs. | Thimble | 3 months |
| | 7 | Gridley | Am. Med. Record, p. 473 | 9 | Pencil, 16/10 inches | 6 months |
| 1828 | 8a | Anonymous | Rev. in N. Y. Med. Clin. Bull., 1831-2, p. 57 | ? | (?) | ? |
| 1831 | 8b | | Rev. in N. Y. Med. Clin. Bull., 1831-2, p. 57 | 2 | Grain of wheat | 7 months |
| | 8c | | Rev. in N. Y. Med. Clin. Bull., 1831-2, p. 57 | adult | Nut shell | ventricle of large larynx |
| | 8d | | Rev. in N. Y. Med. Clin. Bull., 1831-2, p. 57 | 3 | Pea | 16 days |
| | 8e | | Rev. in N. Y. Med. Clin. Bull., 1831-2, p. 57 | 6 mos. | Piece of cocoanut | 3 days |
| 1832 | 9 | Wells | Am. Jour. Med. Sc., p. 28 | 4 | Watermelon seed | 6 days |
| 1835 | 10 | Dow | Boston M. & S. Jour., Vol. XI, p. 269 | 8 | Pin | ½ hour |
| | 11 | Parrish | Am. J. M. Sc., p. 540 | 4 | Thimble | ? |
| 1837 | 12 | Wallace | Boston M. & S. Jour., p. 205 | adult | 3 teeth on plate | 46 days |
| 1844 | 13 | Morse | Boston M. & S. Jour., p. 118 | 2 | Coffee bean | bifurcated 3 days in bel. furcat. 19 days |
| 1845 | 14 | Brainard | Ill. Med. Soc. Jour., p. 100 | 1 | Watermelon seed | ? |
| | 15 | Hall | Am. Jour. Med. Sc., Vol. 9, p. 357 | 4 | Pipe stem 1½ inches; right bronchus | ? |
| 1846 | 16 | Bartlett | N. Y. Med. Jour., p. 23 | 2½ | Bone ¾x¼x1/12 inches | 60 years |
| | 17 | Fell | N. Y. Med. & Surg. Rep., Vol. 1, p. 130 | 47 | Bone | 4 months |
| 1847 | 18 | Bannister | Boston M. & S. Jour., p. 142 | 2½ | Cylindrical brass plate, ¾x¼x¾ in. | 6 weeks |
| 1847 | 19 | Allen | Boston M. & S. Jour., p. 195 | 14 | Charcoal, size of bean | 10 days |
| 1849 | 20 | Bailey | Charleston Med. Jour., p. 420 | 11 | "Cockspur" | 3 years |
| | 21 | Eve | Southern M. & S. Jour., p. 73 | 9 | Beef bone | ? |
| 1851 | 22 | Gilbert | Am. J. M. Sc., p. 74 | 1 | Coffee grain | 24 hours |
| | 23 | Gilbert | Am. J. M. Sc., p. 74 | 3½ | Raw sweet potato | ? |
| | 24 | Gilbert | Am. J. M. Sc., p. 74 | 6 | Grain of corn | ? |
| | 25 | Peaslee | New Hamp. J. of Med., p. 197 | 4 | Sponge, size of white bean | ? |
| 1852 | 26 | Meay | Am. Jour. Med. Sc., p. 413 | 5 | Coffee bean | ? |
| | 27 | Meay | Am. Jour. Med. Sc., p. 413 | 5 | Grain of corn | ? |
| 1853 | 28 | Dugas | Southern Med. Jour., p. 453 | 12 | Cockle burr | ? |
| | 29 | Johnson | Virginia M. & S. Jour., Vol. L, p. 31 | 8 | Grain of corn | ? |
| | 30 | Mussey | Western Lancet, p. 660 | 7 | Bone | ? |
| | 31 | Pepper | Trans. Coll. Phys., Phila., Vol. II, p. 81, 319 | 18 mos. | Grain of coffee | 3 years |
| | 32 | Pepper | Trans. Col. Phys., Phila., Vol. II, p. 81, 319 | child | Deciduous tooth | 5 months |
| 1854 | 33 | Davis | Am. M. Monthly, Vol. II, p. 81 | 10 mos. | 2 citron melon seeds | ? |
| | 34 | Davis | Am. M. Monthly, Vol. II, p. 81 | 8 | Broken nail | ? |
| | 35 | Davis | Am. M. Monthly, Vol. II, p. 81 | 16 | Coffee | 4 weeks |
| | 36 | Davis | Am. M. Monthly, Vol. II, p. 81 | woman | Bone | 1 year |
| 1855 | 37 | Thayer | Boston M. & S. Jour., Vol. 50, p. 389 | 70 | Meat in esophagus | ? |
| | 38 | Anthoniess | ibid., Vol. 51, p. 321 | man | Fish | ? |
| | 39 | Crounse | ibid., Vol. 53, p. 485 | 7 | Hickory nut shell | 10 days |
| | 40 | Eve | Nashville Jour. Med. & Surg., p. 270 | 4 | Grain of corn; right bronchus | 2 weeks |
| 1856 | 41 | Eve | ibid., Vol. 10, p. 32 | 11 | Cockle burr, larynx | 2 days |
| | 42 | Smith | Med. Exam., Phila., Vol. 12, p. 457 | 4 | Grain of corn | 7 weeks |
| | 43 | Slaughter | Atlanta M. & S. Jour., p. 449 | 3 | 3 watermelon seeds | 40 hours |
| | 44 | Woodward | Northwestern M. & S. Jour., p. 59 | girl | Hickory nut shell, ¾x½ inch | 30 days |
| 1857 | 45 | Eve | Nashville Jour., p. 234 | 3 | Tin, 7/10x3/20 inch; angles and sharp points | 6 days |
| | 46 | Wood | Cincinnati Lancet, Vol. 1, p. 446 | 6 | Fibert shell, 4/10x3/10x1/10 inches | 4 years |
| | 47 | Salter | Boston M. & S. Jour., Vol. 57, p. 82 | boy | bbble, size and shape lima bean | 2 months |
| | 48 | Colgrove | ibid., Vol. 58, p. 514 | 4 | Copper cent; esophagus | 1 month |
| 1859 | 49 | Brainard | Chicago Med. Jour., Vol. 2, p. 133 | 2 | Shell of hazel nut | 3 months |
| 1858 | 50 | Carow | Nashville Monthly Rec., p. 91 | 6 | Watermelon seed | 9 days |
| 1859 | 51 | Carow | Buffalo Jour., Vol. 15, p. 404 | 4½ | Bece of apple | 2 days |

| | LOCATION DURATION | TREATMENT | RESULT | REMARKS |
|-------|----------------------------------|---|----------------------|---|
| | Trachea 6 weeks | Tracheotomy; cough-up Tracheotomy; ejected into mouth, swallowed; passed by bowel | Recovery Recovery | |
| | 2 hours | Tracheotomy; extraction by flat probe | Recovery | |
| | ? | Tracheotomy; cough-up | Recovery | |
| | 58 days | Tracheotomy; cough-up | Recovery | "Symptoms of worms" |
| | 3 months | Extracted by forceps from naso-pharynx | Recovery | "Symptoms of worms" |
| | 6 months | Spontaneous cough-up | Recovery | "Symptoms of worms" |
| | ? | (?) (?) (?) (?) | (?) | Verdun performed bronchotomy for foreign body in 1717 Autopsy |
| | 7 mos. in ventricle of larynx | None | Death | |
| | 7 years larynx | Spontaneous cough-up | Recovery | |
| | 16 days | Tracheotomy; removal | Recovery | |
| | 3 days | Tracheotomy; cough-up after 9 days | Recovery | |
| | 6 days | Tracheotomy; cough-up | Recovery | |
| | ½ hour | Small protrusion ant. surface of larynx; incision, pin presented; withdrawn; head freed by enlarging incision | Recovery | |
| | ? | "Extracted from pterygoid fossa" | Recovery | |
| | 46 days, nr bifurcation? | Coughed up "with 1½ pints of pus" | Improving | A physician |
| | 3 days, 2 in. below bifurcation? | None | Death | Autopsy; "marked reaction" |
| | 19 days | Tracheotomy; not found | Death at 21st day | Autopsy; "at bifurcation" |
| chus | ? | Tracheotomy; extraction by probe | Recovery | |
| | 60 years | Cough-up; pus and blood | Recovery | |
| | 4 months | Cough-up; pus and blood: "Issues" side of neck | Not improved | |
| in. | 6 weeks | Cough; sneezed up | Recovery | |
| | 10 days | Cough-up | Recovery | |
| | 3 years | Cough-up | Recovery | Unchanged and hard Autopsy |
| | | Perforation posterior laryngeal wall | Death | |
| | 24 hours | Tracheotomy; passed by bowel next day | Recovery | |
| | | Tracheotomy; not found | Recovery | |
| | | Tracheotomy; cough-up | Recovery | |
| | | Tracheotomy; partial removal | Death | Autopsy; so adherent that mucous membrane came with it |
| | | Tracheotomy; passed in stool next day | Recovery | |
| | | Tracheotomy; extraction | Recovery | |
| | | Extracted from larynx; curved forceps | Recovery | |
| | | Tracheotomy; cough-up | Recovery | |
| | | Tracheotomy; cough-up in 3 days | Recovery | |
| | 3 years | | Death | Autopsy; pulmonary abscess; coffee unchanged |
| | 5 months | Spontaneous cough-up | Recovery | |
| | | Tracheotomy; one cough-up at once, the other 10 days later | Recovery | |
| | | Tracheotomy; cough-up in 9 days | Recovery | |
| | 4 weeks | Spontaneous cough-up | Recovery | |
| | 1 year | Spontaneous cough-up | Recovery | |
| | | "Brought up by kneading" | Recovery | |
| | | Lateral esophagotomy | Recovery | Swallowed while bating hook |
| | 10 days | Cough-up | Recovery | |
| | 2 weeks | Cough-up | Recovery | |
| | 2 days | Curved polypus forceps; guidance of finger | Recovery | |
| | 7 weeks | Tracheotomy; extraction | Recovery | |
| | 40 hours | Tracheotomy; 2 cough-up at once, 1 a week later | Recovery | |
| | 30 days | Cough-up; "pure pus" | (?) | Pyothorax; drained |
| sharp | 6 days | Tracheotomy; cough-up | Recovery | |
| hes | 4 years, | Cough-up | Recovery | |
| an | 2 months | | | |
| | 1 month | Tracheotomy; cough-up | Recovery | |
| | | Removed by a bent, doubled wire, running in a web catheter | Recovery | Many ineffectual attempts |
| | 3 months | Tracheotomy; cough-up | Recovery | |
| | 9 days | Tracheotomy; cough-up in 5 days. | Recovery | |
| | 2 days | Tracheotomy; cough-up in 3 days | Recovery | |

| | | | | | |
|------|-------------|--|----------------------|---|-------|
| 34 | Davis | Am. M. Monthly, Vol. II, p. 81 | 8 | Broken nail | |
| 35 | Davis | Am. M. Monthly, Vol. II, p. 81 | 16 | Coffee | |
| 36 | Davis | Am. M. Monthly, Vol. II, p. 81 | woman | Bone | 4 w |
| 355 | Thayer | Boston M. & S. Jour., Vol. 50, p. 339 | 70 | Meat in esophagus | 1 y |
| 38 | Anthoniess | ibid., Vol. 51, p. 321 | man | Fish | |
| 39 | Crounse | ibid., Vol. 53, p. 485 | 7 | Hickory nut shell | 10 d |
| 40 | Eve | Nashville Jour. Med. & Surg., p. 270 | 4 | Grain of corn; right bronchus | 2 w |
| 856 | Eve | ibid., Vol. 10, p. 32 | 11 | Cockle burr, larynx | 2 d |
| 42 | Smith | Med. Exam., Phila., Vol. 12 p. 457 | 4 | Grain of corn | 7 w |
| 43 | Slaughter | Atlanta M. & S. Jour., p. 449 | 3 | 3 watermelon seeds | 40 h |
| 44 | Woodward | Northwestern M. & S. Jour., p. 59 | girl | Hickory nut shell, $\frac{1}{4} \times \frac{1}{8}$ inch | 30 d |
| 1857 | Eve | Nashville Jour., p. 234 | 3 | Tin, 7/10x3/20 inch; angles and sharp points | 6 d |
| 46 | Wood | Cincinnati Lancet, Vol. 1, p. 446 | 6 | Flint shell, 4/10x3/10x1/10 inches | 4 y |
| 47 | Salter | Boston M. & S. Jour., Vol. 57, p. 82 | boy | Pebble, size and shape lima bean | 2 m |
| 48 | Craigrove | ibid., Vol. 56, p. 514 | 4 | Copper cent; esophagus | 1 m |
| 859 | Brainard | Chicago Med. Jour., Vol. 2, p. 133 | 2 | Shell of hazel nut | 3 m |
| 1858 | Carow | Nashville Monthly Rec., p. 91 | 6 | Watermelon seed | 9 d |
| 1859 | Conant | Buffalo Jour., Vol. 15, p. 404 | 4 $\frac{1}{2}$ | Piece of apple | 2 d |
| 52 | Garland | Boston M. & S. Jour., Vol. 61, p. 438 | 4 | Indian corn | 3 d |
| 53 | Stone | New Orleans M. & S. Jour., Vol. 16, p. 737 | 20 mos. | Gourd seed | |
| 54 | Stone | New Orleans M. & S. Jour., Vol. 16, p. 737 | 3 | Orange seed | 36 h |
| 55 | Stone | New Orleans M. & S. Jour., Vol. 16, p. 737 | 7 | Fine burr | 48 h |
| 56 | Toothaker | Boston M. & S. Jour., Vol. 60, p. 160 | 18 mos. | Squash seed | 11 m |
| 57 | Cutter | Boston M. & S. Jour., Vol. 60, p. 160 | 17 yrs. | Pine | |
| 1860 | Adler | N. Am. Med.-Chir. Rev., Vol. 4, p. 1062 | 7 | Pipe stem, 1x5/16 in.; right bronchus | 1 v |
| 59 | Newman | Boston M. & S. Jour., Vol. 62, p. 199 | 2 | Watermelon seed | 48 h |
| 60 | Newman | Boston M. & S. Jour., Vol. 62, p. 199 | 3 | Coffee | 3 m |
| 61 | Mason | Am. J. M. Sc., Vol. 39, N. S., p. 122 | 7 | Persimmon pit | 6 d |
| 62 | Clark | N. Y. Jour. of Med., p. 100 | man | Chestnut shell | 6 y |
| 63 | Loving | Columbus Rev. Med. & Surg., Vol. 1, p. 249 | 11 mos. | Grain of corn | 6 w |
| 64 | Rawson | Am. Med. Times, Vol. 1, p. 222 | 4 $\frac{1}{2}$ yrs. | Watermelon seed | 24 h |
| 65 | Terry | M. & S. Rep., Vol. 4, p. 4 | 10 mos. | Scoil brass spring, $\frac{7}{8} \times 5/12$ inches; embedded at bifurcation | 14 m |
| 66 | Eldredge | Trans. Rhode Island Med. Soc., 1860, p. 82 | woman | Brass tip of umbrella rib, 1 $\frac{1}{4}$ in. long; corroded | 23 y |
| 1861 | Bates | Am. Med. Monthly, Vol. 16, p. 111 | 7 | Lead of timothy grass, 1 $\frac{1}{2}$ in. | 23 m |
| 68 | Bostford | ibid., p. 470 | man | Threaded tailor's needle, 2 inches | |
| 69 | Blackman | Cincinnati Lancet, Vol. 4, p. 95 | 21 | Cockle burr | 8 d |
| 70 | Blackman | Cincinnati Lancet, Vol. 4, p. 95 | | Cockle burr | |
| 1862 | Bartlett | Chicago Med. Exam., Vol. 3, p. 229 | child | White bean; "so swollen as to fill trachea" | |
| 72 | Toothaker | Boston M. & S. J., V. 63, p. 83 | 18 mos. | Squash seed | 2 w |
| 1863 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 6 | Pebble | 4 w |
| 74 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 16 | Half chestnut shell | sever |
| 75 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 6 | Slate pencil | 2 w |
| 76 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 50 | Copper cent | 4 w |
| 77 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | infant | Coffee | 3 w |
| 78 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 25 | Lone, $\frac{3}{4} \times 1/16$ in. | 3 w |
| 79 | Walter | Am. J. M. Sc., V. 45, N.S., p. 56 | 4 $\frac{1}{2}$ | Sugared corn; left bronchus | 6 w |
| 80 | McDowell | Am. Med. Times, V. 7, p. 83 | 6 | Grain of corn | 2 w |
| 81 | Logan | Pac. M. & S. Jour., V. 6, p. 151 | 1 | Velon seed | 5 m |
| 82 | Hatch | Pac. M. & S. Jour., V. 6, p. 21 | | Velon seed | 6 w |
| 1864 | Miner | Buffalo M. & S. Jour., p. 129 | woman | Lone, 1x $\frac{1}{2}$ in.; left bronchus | |
| 1866 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | 8 | Fish hook; snell in mouth; point in hypopharynx | |
| 85 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | man | Chicken bone; esophagus | 4 d |
| 86 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | man | Chicken bone, esophagus | |
| 1867 | Hodges | Boston Soc. for Med. Improvement, Vol. 6, p. 201 | boy | Cherry stone with pin | 3 |
| 88 | Hodges | Boston Soc. for Med. Improvement, Vol. 6, p. 201 | woman | Sawd pin; glass head | |
| | | | man | Pin; half franc | |

| | | | | |
|---------|--------------|---|----------|---|
| | 4 weeks | Tracheotomy; cough-up in 5 days | Recovery | |
| | 1 year | Spontaneous cough-up | Recovery | |
| | | Spontaneous cough-up | Recovery | |
| | | "Brought up by kneading" | Recovery | |
| | 10 days | Lateral esophagotomy | Recovery | Swallowed while bating hook |
| | 2 weeks | Cough-up | Recovery | |
| | | Cough-up | Recovery | |
| | 2 days | Curved polypus forceps; guidance of finger | Recovery | |
| | 7 weeks | Tracheotomy; extraction | Recovery | |
| | 40 hours | Tracheotomy; 2 cough-up at once, 1 a week later | Recovery | |
| | 30 days | Cough-up; "pure pus" | (?) | Pyothorax; drained |
| sharp | 6 days | Tracheotomy; cough-up | Recovery | |
| nes | 4 years, | Cough-up | Recovery | |
| | 2 months | | | |
| an | 1 month | Tracheotomy; cough-up | Recovery | |
| | | Removed by a bent, doubled wire, finning in a web catheter | Recovery | Many ineffectual attempts |
| | 3 months | Tracheotomy; cough-up | Recovery | |
| | 9 days | Tracheotomy; cough-up in 5 days. | Recovery | |
| | 2 days | Tracheotomy; cough-up in 3 days | Recovery | |
| | 3 days | Tracheotomy; cough-up in 1 week | Recovery | |
| | | Tracheotomy; cough-up | Recovery | |
| | 36 hours | None | Death | Sudden |
| | 48 hours | None | Death | Sudden |
| | 11 months | Cough-up | Recovery | |
| | | Placed on abdomen, pounded on back; dime fell out | Recovery | |
| nchus | 1 week | Tracheotomy; extracted by wire loop | Recovery | Left bronchus |
| | 48 hours | Tracheotomy; cough-up | Recovery | |
| | 3 months | Tracheotomy; cough-up | Recovery | |
| | 6 days | Tracheotomy; cough-up | Recovery | |
| | 6 years | Cough-up | Recovery | Shell unchanged |
| | 6 weeks | Tracheotomy; cough-up | Recovery | |
| ches; | 24 hours | Tracheotomy; cough-up in 15 minutes | Recovery | |
| | 14 months | No treatment | Death | Autopsy |
| long; | 23 years | Cough-up; death 4 days later; T. B. | Death | Autopsy |
| | 23 months | Cough-up | Recovery | |
| nes | | Point felt in cricoid region; incision on point; withdrawal with thread | Recovery | |
| | 8 days | Thyrotomy; pushed up into mouth | Recovery | |
| | | Thyrotomy; pushed up into mouth | Recovery | |
| to fill | | Tracheotomy | Death | During operation |
| | 2 weeks | Cough-up | Recovery | |
| | 4 weeks | Tracheotomy; cough-up | Recovery | |
| | several wks. | Tracheotomy; forceps; removal | Recovery | |
| | 2 weeks | Tracheotomy; forceps; removal | Recovery | |
| | 4 weeks | Tracheotomy; forceps; removal | Recovery | |
| | 3 weeks | Tracheotomy; forceps; removal | Recovery | |
| | 3 weeks | Tracheotomy; forceps; removal | Recovery | |
| | 6 weeks | Tracheotomy | Death | Autopsy; occlusion of left bronchus |
| | 2 weeks | Tracheotomy; forceps; removal | Recovery | |
| | 5 months | Cough-up | Recovery | |
| | 6 weeks | Cough-up | Recovery | |
| | | Tracheotomy; forceps | Recovery | |
| int in | | Disengaged and extracted | Recovery | |
| | 4 days | Extracted by a "floating hook" on a whalebone stem | Recovery | In discussion the danger of such an instrument was emphasized |
| | | Sponge probang induced vomiting and expulsion of bone | Recovery | |
| | 3 weeks | Tracheotomy unsuccessful; discharge later on removing tube | Recovery | |
| | | Tracheotomy; point forced through skin and broken off; head seized internally and brought out | Recovery | |
| | 6 weeks | Cough; pounding on back; expulsion | Recovery | |

| | | | | | | |
|------|-----|----------------|---|---------|---|--------------|
| 1864 | 80 | McDowell | Am. Med. Times, V. 7, p. 88 | 6 | Grain of corn | |
| | 81 | Logan | Pac. M. & S. Jour., V. 6, p. 151 | 1 | Nelson seed | 5 m |
| | 82 | Hatch | Pac. M. & S. Jour., V. 6, p. 21 | | Nelson seed | 6 we |
| 1866 | 83 | Miner | Buffalo M. & S. Jour., p. 129 | woman | Bone, 1x½ in.; left bronchus | |
| | 84 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | 8 | Fish hook; snell in mouth; point in hypopharynx | |
| | 85 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | man | Chicken bone; esophagus | 4 da |
| 1867 | 86 | H. B. Sands | N. Y. Med. J., Vol. 3, p. 214 | man | Chicken bone, esophagus | |
| | 87 | Hodges | Boston Soc. for Med. Improvement, Vol. 6, p. 201 | boy | Cherry stone with pin | 3 w |
| | 88 | Hodges | Boston Soc. for Med. Improvement, Vol. 6, p. 201 | woman | Shawl pin; glass head | |
| | 89 | Oliver | ibid, p. 112 | man | Coin; half franc | 6 we |
| | 90 | Adams | ibid, p. 138 | 67 | Bone in right bronchus, 1x½ in.; 1 inch below bifurcation | 3 we |
| 1868 | 91 | Cotting | ibid, p. 138 | woman | Fish bone; esophagus | 4 da |
| | 92 | Andrews | Chicago M. Ex., Vol. 8, p. 70 | child | Grain of corn | |
| | 93 | Davis | Cincinnati Lancet, V. 10, p. 590 | 7 | Grain of corn | 3 da |
| | 94 | Louis Sayre | N. Y. M. Rec., V. 3, p. 271 | man | Casp tooth plate; 3 teeth | |
| | 95 | Scott | Med. & Surg. Rep., Phila., Vol. 19, p. 145 | 5 | Grain of corn | |
| 1869 | 96 | Pillsbury | Boston M. & S. J., V. 78, p. 165 | 5 | Amarind seed | 2 da |
| | 97 | Reeve | Am. J. M. Sc., V. 38, N.S., Nov. | 8 | Shawl pin, 3¼ in. | |
| | 98 | Buck | N. Y. Med. Rec., V. 5, p. 278 | 25 | Fish bone | 2 ye |
| 1870 | 99 | Doe | Boston M. & S. J., V. 82, p. 421 | 28 mos. | Shawl pin, 1½ in.; glass head | 3 mo |
| | 100 | McArthur | Cincinnati Lancet, V. 13, p. 294 | 10 | Ar gun dart | 33 da |
| | 101 | McArthur | Cincinnati Lancet, V. 13, p. 294 | 4 | Grain of corn | 10 ho |
| | 102 | Snyder | Chicago M. Ex., V. 11, p. 402 | 60 | Knife blade, 1x½ in.; stabbed in back 12 years before | 34 ho |
| 1871 | 103 | Ashurst | Am. J. M. Sc., Vol. 61, p. 393 | 4½ | Lye stricture; esophagus | 12 ye |
| | 104 | Baldwin | Phila. Med. Times, V. 1, p. 237 | 10 mos. | Nickel cent; bronchus (?) | 2 ye |
| | 105 | Hamilton | Bull. N. Y. Acad. M., p. 147 | boy | Tn whistle | 4 mo |
| | 106 | Hall | Richmond & Louisville Med. Jour., Vol. 12, p. 605 | 4½ | Bean; in trachea | 14 da, a few |
| | 107 | Hubbard | Phila. M. Times, V. 1, p. 373 | man | Dime; bronchus | 1 mo |
| | 108 | Henick | Boston M. & S. Jour., p. 108 | 14 mos. | Shawl pin; 2 in. | 4 ye |
| | 109 | Abstract | N. Y. Med. J., Vol. 14, p. 314 | 56 yrs. | Bone; perforating esophagus and vena cava | |
| | 110 | Van der Warker | ibid, Vol. 13, p. 453 | 36 | Bone, 1x½ in.; perforating esophagus | |
| 1872 | 111 | Batchelder | Dental Cosmos, V. 14, p. 469 | 65 | Set of teeth, 2½x1½ in. | 15 mo |
| | 112 | Brandeis | Am. Practit., Vol. 8, p. 317 | 34 | Thread | 4 m |
| | 113 | Bordley | Nebraska State Soc., 1873, p. 12 | child | Lye stricture; esophagus | |
| | 114 | Smith | N. Y. Med. Times, Sept., p. 56 | woman | False teeth | |
| | 115 | Burch | Richmond & Louisville M. J., Vol. 16, p. 681 | 8 | Glass bead | 6 ho |
| | 116 | Burch | Richmond & Louisville M. J., Vol. 16, p. 681 | 16 | Cockle burr | 48 ho |
| | 117 | Lefferts | N. Y. Med. Rec., V. 9, p. 641 | 6½ | Broken brass ring; larynx | 4 ye |
| | 118 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 3 | Husk of beech nut | 24 ho |
| | 119 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 9 | Half of glass button | 11 da |
| | 120 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 4½ | Kidney bean | 17-20 |
| | 121 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 9½ | Oyster shell, ½x½ in. | 4 we |
| | 122 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 7 | Pumpkin seed | |
| 1874 | 123 | Durham | Trans. Med. Ass., Ga., p. 122 | man | Piece of beef | 24 ho |
| 1875 | 125 | Brigham | Med. News & Lib., V. 33, p. 74 | 3 | Quarter | 6 ho |
| 1876 | 126 | Cheever & Gay | Boston M. & S. J., V. 60, p. 391 | 1 | Match | 5 ho |
| 1877 | 127 | Connor | Am. J. M. Sc., Vol. 74, p. 395 | 11 | Blow gun dart | 24 ho |
| 1876 | 128 | Stevens | Boston M. & S. J., V. 95, p. 463 | 79 | Pine wood, 1½x½ in.; and pin, 9/16 in. | |
| | 129 | Stanford | N. Y. Med. J., Vol. 24, p. 368 | 14 | Bean | 13 da |
| | 130 | Mason | N. Y. Med. J., Vol. 24, p. 628 | 6 | Pewter plate, 1½ in. diam.; ¼ in. thick | 24 ho |
| | 131 | Fisher | N. Y. Med. Rec., Dec. 2, p. 787 | 11 mos. | Melon seed | 3 we |
| | 132 | Yandell | Louisville M. News, V. 2, p. 43 | 4 | Brass ring hooked over epiglottis | 24 ho |
| | 133 | Longworth | Cincinnati Clin., V. 10, p. 237 | 3 | Pebble, ½x¼ in. | 7 we |
| | 134 | Johnston | Arch. Clin. Surg., V. 1, p. 211 | 14 | Grain of corn | 4 da |
| | 135 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 2 | Toy locomotive | 4 mo |
| | 136 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | woman | Hickory nut shell; larynx | 7 ho |
| | 137 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 9 mos. | Shirt button; transfixd by pin | |
| | 138 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 15 mos. | Popcorn; uncooked | 8 da |
| | 139 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 7 | Peanut | 12 we |
| | 140 | Larimore | Ohio Med. Rec., Vol. 1, p. 171 | 11 | Grain of corn | a few |
| 1877 | 141 | Luse | Ohio Med. Rec., Vol. 2, p. 67 | 26 mos. | Beech nut hull | 3 mo |
| | | | | | Hickory nut shell, 7/16x5/16 in. | 13 y |
| | 142 | Breakell | N. Y. Med. Rec., V. 12, p. 356 | 4 yrs. | | 3 mo |
| | 143 | Field | N. Y. Med. Rec., V. 12, p. 148 | 25 | Part of peach pit | 17 da |
| | 144 | Inge | Southern Med. Rec., V. 7, p. 58 | 2½ | Needle; larynx | 6 mo |
| | 145 | Ward | Arch. Clin. Surg., V. 1, p. 335 | 24 | Watermelon seed | ½ ho |
| | 146 | Ward | N. Y. Med. Rec., V. 15, p. 208 | man | Pin; post nares | 6 we |
| | 147 | Ward | N. Y. Med. Rec., V. 15, p. 208 | man | Dime | |

| | | | |
|---------------------------------------|---|-------------------|---|
| 5 months | Cough-up | Recovery | |
| 6 weeks | Cough-up | Recovery | |
| | Tracheotomy; forceps | Recovery | |
| | Disengaged and extracted | Recovery | |
| 4 days | Extracted by a "floating hook" on a whalebone stem | Recovery | In discussion the danger of such an instrument was emphasized |
| 3 weeks | Sponge probang induced vomiting and expulsion of bone | Recovery | |
| | Tracheotomy unsuccessful; discharge later on removing tube | Recovery | |
| | Tracheotomy; point forced through skin and broken off; head seized internally and brought out | Recovery | |
| 6 weeks | Cough; pounding on back; expulsion | Recovery | |
| 3 weeks | No treatment | Death | Autopsy |
| 4 days | Extracted; bristle probang | Recovery | |
| | Tracheotomy; cough-up | Recovery | |
| 3 days | Tracheotomy; extraction | Recovery | |
| | Extraction; sponge probang | Recovery | |
| | Tracheotomy; extraction | Recovery | Ardent advocate of probang |
| 2 days | Tracheotomy; cough-up | Recovery | |
| | Tracheotomy; extraction | Recovery | |
| 2 years, 3 months | Tracheotomy; no bone found; cough-up 14 years later | Recovery | |
| 33 days | Tracheotomy; extraction | Recovery | |
| 10 hours | Tracheotomy; seen, missed; not found again | (?) | Still in at time of report |
| 34 hours | Tracheotomy; extraction | Recovery | |
| 12 years | Cough-up | Recovery | Had forgotten stabbing |
| 2 years | After attempted bouginage; 5 days | Death | Firm band 1½ inches above cardia; autopsy |
| 4 months, 14 days | Cough-up | Recovery | |
| a few weeks | Cough-up | Recovery | |
| | No treatment | Death | Autopsy |
| 1 month | Emetic; expulsion | Recovery | |
| 4 years | Cough-up | Recovery | |
| | No treatment | Death | Autopsy |
| | Probang ineffectual | Death | Autopsy; peri-esophageal abscess |
| 15 months | Cough-up | Recovery | |
| 4 months | Withdrawn by laryngeal brush dipped in mucilage | Recovery | |
| | Gradual dilatation | Improvement | |
| | No treatment | Death | Autopsy; perforation of esophagus |
| 6 hours | Tracheotomy; cough-up | Recovery | |
| 48 hours | Tracheotomy; dislodged; swallowed | Recovery | Not found in stool |
| 4 years | Tracheotomy; extraction | Recovery | |
| 24 hours | Tracheotomy; pushed up into pharynx | Recovery | |
| 11 days | Tracheotomy; cough-up in 7 days | Recovery | |
| 17-20 days | Cough-up in fragments; at intervals | Recovery | |
| 4 weeks | Cough-up | Recovery | |
| | Cough-up | Recovery | |
| 24 hours | Esophagotomy; removal | Recovery | |
| 6 months | Probang | Recovery | |
| 5 hours | Tracheotomy; removal | Death in 24 hours | Child had pertussis; head of match dissolved |
| 24 hours | Tracheotomy; cough-up in 16 days | Recovery | |
| 13 days | Cough-up | Recovery | |
| 24 hours | Bristle probang | Recovery | |
| 3 weeks | Tracheotomy; cough-up in 7 days | Recovery | |
| 24 hours | Forceps | Recovery | |
| 7 weeks | Tracheotomy; cough-up | Recovery | |
| 4 days | Tracheotomy; removal | Recovery | |
| 4 months | Tracheotomy immediately; after 4 mo. remov. by thyrotomy | Death | Dead on arrival; autopsy |
| 7 hours | No treatment | Recovery | |
| | Cough up button in a few weeks | Death | |
| | Cough up pin in a few months | Recovery | |
| 8 days | No treatment | Recovery | |
| 12 weeks | Cough-up | Recovery | |
| a few weeks | Cough-up | Recovery | |
| 3 months | Cough-up | Recovery | |
| 13 years, 3 months, 3 months, 17 days | Cough-up | Recovery | |
| 6 months | Cough-up | Recovery | |
| ½ hour | Needle; larynx; incision over point; withdrawal | Recovery | |
| 6 weeks | Tracheotomy; cough-up in 10 days | Recovery | |
| | Forceps | Recovery | |
| | Inversion of body; coin expelled | Recovery | Tracheotomy done for gumma |

| | | | | | | | |
|------|-----|----------------|---|----------|------|--|--------------|
| | 99 | Doe | Boston M. & S. J., V. 83, p. 221 | 23 | mos. | Shawl pin, 1½ in., glass head | 33 days |
| | 100 | McArthur | Cincinnati Lancet, V. 13, p. 204 | 10 | | Air gun dart | 10 hours |
| | 101 | McArthur | Cincinnati Lancet, V. 13, p. 204 | 4 | | Grain of corn | 24 hours |
| | 102 | Snyder | Chicago M. Ex., V. 11, p. 402 | 60 | | Rifle blade, 1x½ in.; stabbed in back 12 years before | 12 years |
| 1871 | 103 | Ashurst | Am. J. M. Sc., Vol. 61, p. 393 | 4½ | | Lie stricture; esophagus | 2 years |
| | 104 | Baldwin | Phila. Med. Times, V. 1, p. 237 | 10 | mos. | Nickel cent; bronchus (?) | 4 months |
| | 105 | Hamilton | Bull. N. Y. Acad. M., p. 147 | boy | | Tin whistle | 14 days |
| | 106 | Hall | Richmond & Louisville Med. Jour., Vol. 12, p. 605 | 4½ | | Bean; in trachea | a few weeks |
| | 107 | Hubbard | Phila. M. Times, V. 1, p. 373 | man | | Dime; bronchus | 1 month |
| | 108 | Henick | Boston M. & S. Jour., p. 108 | 14 | mos. | Shawl pin; 2 in. | 4 years |
| | 109 | Abstract | N. Y. Med. J., Vol. 14, p. 314 | 56 | yrs. | Bone; perforating esophagus and vena cava | |
| | 110 | Van der Warker | ibid, Vol. 13, p. 453 | 36 | | Bone, 1x¾ in.; perforating esophagus | |
| 1872 | 111 | Batchelder | Dental Cosmos, V. 14, p. 469 | 65 | | Set of teeth, 2¼x1½ in. | 15 months |
| 1873 | 112 | Brandeis | Am. Practit., Vol. 8, p. 317 | 34 | | Thread | 4 months |
| | 113 | Bordley | Nebraska State Soc., 1873, p. 12 | child | | Lye stricture; esophagus | |
| | 114 | Smith | N. Y. Med. Times, Sept., p. 56 | woman | | False teeth | |
| | 115 | Burch | Richmond & Louisville M. J., Vol. 16, p. 681 | 6 | | Glass bead | 6 hours |
| | 116 | Burch | Richmond & Louisville M. J., Vol. 16, p. 681 | 16 | | Cockle burr | 48 hours |
| | 117 | Lefferts | N. Y. Med. Rec., V. 9, p. 641 | 6½ | | Broken brass ring; larynx | 4 years |
| | 118 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 3 | | Husk of beech nut | 24 hours |
| | 119 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 9 | | Half of glass button | 11 days |
| | 120 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 4½ | | Kidney bean | 17-20 days |
| | 121 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 9½ | | Oyster shell, ½x¾ in. | 4 weeks |
| | 122 | Dawson | Cincinnati Clin., Vol. 6, p. 2 | 7 | | Pumpkin seed | |
| 1874 | 123 | Durham | Trans. Med. Ass., Ga., p. 122 | man | | Piece of beef | 24 hours |
| 1875 | 125 | Brigham | Med. News & Lib., V. 33, p. 74 | 3 | | Quarter | 6 months |
| 1876 | 126 | Cheever & Gay | Boston M. & S. J., V. 50, p. 391 | 1 | | Match | 5 hours |
| 1877 | 127 | Connor | Am. J. M. Sc., Vol. 74, p. 395 | 11 | | Blow gun dart | 24 hours |
| 1876 | 128 | Stevens | Boston M. & S. J., V. 95, p. 463 | 79 | | Pine wood, 1½x¾ in.; and pin, 9/16 in. | 13 days |
| | 129 | Stanford | N. Y. Med. J., Vol. 24, p. 368 | 14 | | Bean | 24 hours |
| | 130 | Mason | N. Y. Med. J., Vol. 24, p. 628 | 6. | | Pewter plate, 1½ in. diam.; ¼ in. thick | 3 weeks |
| | 131 | Fisher | N. Y. Med. Rec., Dec. 2, p. 787 | 11 | mos. | Melon seed | 24 hours |
| | 132 | Yandell | Louisville M. News, V. 2, p. 43 | 3 | | Brass ring hooked over epiglottis | 7 weeks |
| | 133 | Longworth | Cincinnati Clin., V. 10, p. 237 | 4 | | Pebble, ½x¼ in. | 4 days |
| | 134 | Johnston | Arch. Clin. Surg., V. 1, p. 211 | 14 | | Grain of corn | 4 months |
| | 135 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 2 | | Toy locomotive | 7 hours |
| | 136 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | woman | | Hickory nut shell; larynx | |
| | 137 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 9 | mos. | Shirt button; transfixd by pin | |
| | 138 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 15 | mos. | Popcorn; uncooked | 8 days |
| | 139 | Hamilton | Ohio Med. Rec., Vol. 1, p. 1 | 7 | | Peanut | 12 weeks |
| | 140 | Larimore | Ohio Med. Rec., Vol. 1, p. 171 | 11 | | Grain of corn | a few weeks |
| 1877 | 141 | Luse | Ohio Med. Rec., Vol. 2, p. 67 | 26 | mos. | Beech nut hull | 3 months |
| | 142 | Breakell | Ohio Med. Rec., Vol. 2, p. 67 | 26 | mos. | Hickory nut shell, 7/16x5/16 in. | 3 months |
| | 143 | Field | N. Y. Med. Rec., V. 12, p. 356 | 4 | yrs. | Part of peach pit | 17 days |
| | 144 | Inge | N. Y. Med. Rec., V. 12, p. 148 | 25 | | Needle; larynx | 6 months |
| | 145 | Ward | Southern Med. Rec., V. 7, p. 58 | 2½ | | Watermelon seed | ½ hour |
| 1878 | 146 | Leaming | Arch. Clin. Surg., V. 1, p. 335 | 24 | | Pin; post nares | 6 weeks |
| | 147 | Leaming | N. Y. Med. Rec., V. 15, p. 208 | man | | Dime | |
| | 148 | Leaming | N. Y. Med. Rec., V. 15, p. 208 | man | | Tracheotomy tube; bronchus | several days |
| | 149 | Leaming | N. Y. Med. Rec., V. 15, p. 208 | man | | Head of timothy grass; bronchus | 1 week |
| | 150 | Leaming | N. Y. Med. Rec., V. 15, p. 208 | boy | | Collar button | some months |
| | 151 | Leaming | N. Y. Med. Rec., V. 15, p. 208 | boy | | Peach pit | some months |
| | 152 | Duffy | N. Y. Med. Rec., V. 15, p. 208 | boy | | Tooth, bronchus | |
| | 153 | Duffy | N. C. Med. J., Vol. 3, p. 232 | 2½ | | Watermelon seed | 1 day |
| | 154 | Duffy | N. C. Med. J., Vol. 3, p. 232 | child | | Watermelon seed | |
| | 155 | Duffy | N. C. Med. J., Vol. 3, p. 232 | child | | Watermelon seed | |
| | 156 | Duffy | N. C. Med. J., Vol. 3, p. 232 | woman | | Beef gristle, 1x¾ in. | some months |
| | 157 | Cohen | N. C. Med. J., Vol. 3, p. 232 | 9 | mos. | Grains of corn | |
| | 158 | French | Trans. Path. Soc. Phila., Vol. 7, p. 76 | 25 | | Peanut shell, 1½x¾ in. | 14 months |
| | 159 | Horace Greene | Proc. Kings Co. Soc., Vol. 4, p. 17 | 28 | | Pin; larynx | 3 hours |
| 1860 | 160 | Bennett | Am. M. Monthly, V. 13, p. 81 | | | the difficulty and advantage of catheterism of the air passages in diseases of the chest | |
| 1858 | 160 | Bennett | Am. J. M. Sc., Jan., p. 265 | Abstract | | diseases of the bronchi | |

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|--------------|--|-------------------|--|
| 33 days | Tracheotomy; extraction | Recovery | Still in at time of report |
| 10 hours | Tracheotomy; seen, missed; not found again | (?) | |
| 34 hours | Tracheotomy; extraction | Recovery | |
| 12 years | Cough-up | Recovery | Had forgotten stabbing |
| 2 years | After attempted bouginage; 5 days | Death | Firm band 1 1/4 inches above cardia; autopsy |
| 4 months, | Cough-up | Recovery | |
| 14 days | | | |
| a few weeks | Cough-up | Recovery | |
| | No treatment | Death | Autopsy |
| 1 month | Emetic; expulsion | Recovery | |
| 4 years | Cough-up | Recovery | |
| | No treatment | Death | Autopsy |
| | Probang ineffectual | Death | Autopsy; peri-esophageal abscess |
| 15 months | Cough-up | Recovery | |
| 4 months | Withdrawn by laryngeal brush dipped in mucilage | Recovery | |
| | Gradual dilatation | Improvement | |
| | No treatment | Death | Autopsy; perforation of esophagus |
| 6 hours | Tracheotomy; cough-up | Recovery | |
| 48 hours | Tracheotomy; dislodged; swallowed | Recovery | Not found in stool |
| 4 years | Tracheotomy; extraction | Recovery | |
| 24 hours | Tracheotomy; pushed up into pharynx | Recovery | |
| 11 days | Tracheotomy; cough-up in 7 days | Recovery | |
| 17-20 days | Cough-up in fragments; at intervals | Recovery | |
| 4 weeks | Cough-up | Recovery | |
| | Cough-up | Recovery | |
| 24 hours | Esophagotomy; removal | Recovery | |
| 6 months | Probang | Recovery | |
| 5 hours | Tracheotomy; removal | Recovery | |
| | | Death in 24 hours | Child had pertussis; head of match dissolved |
| 24 hours | Tracheotomy; cough-up in 16 days | Recovery | |
| 13 days | Cough-up | Recovery | |
| 24 hours | Bristle probang | Recovery | |
| 3 weeks | Tracheotomy; cough-up in 7 days | Recovery | |
| 24 hours | Forceps | Recovery | |
| 7 weeks | Tracheotomy; cough-up | Recovery | |
| 4 days | Tracheotomy; removal | Recovery | |
| 4 months | Tracheotomy immediately; after 4 mo. remov. by thyrotomy | Death | Dead on arrival; autopsy |
| 7 hours | No treatment | Recovery | |
| | Cough up button in a few weeks | | |
| | Cough up pin in a few months | | |
| 8 days | No treatment | Death | |
| 12 weeks | Cough-up | Recovery | |
| a few weeks | Cough-up | Recovery | |
| 3 months | Cough-up | Recovery | |
| 13 years, | Cough-up | Recovery | |
| 3 months, | | | |
| 17 days | | | |
| 6 months | Cough-up | Recovery | |
| 1/2 hour | Needle; larynx; incision over point; withdrawal | Recovery | |
| 6 weeks | Tracheotomy; cough-up in 10 days | Recovery | |
| | Forceps | Recovery | |
| | Inversion of body; coin expelled | Recovery | |
| several days | Forceps | Recovery | |
| 1 week | Stalk expelled during emesis | Death | Tracheotomy done for gumma |
| some mos. | Tracheotomy; removal | Recovery | Autopsy; hayseed throughout lung |
| some time | Cough-up | Recovery | |
| | No treatment | Death | Autopsy |
| 1 day | Tracheotomy; cough-up in several hours | Recovery | |
| | Tracheotomy; cough-up in several hours | Recovery | |
| | Tracheotomy; cough-up in several hours | Recovery | |
| some hours | Tracheotomy; cough-up in several hours | Recovery | |
| | Tracheotomy; cough-up in several hours | Recovery | |
| 14 months | Cough-up | Recovery | |
| 3 hours | Forceps | Recovery | |

THE NATURE AND ORIGIN OF STAMMERING.*

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INTRODUCTORY.

In all the multitudinous efforts to solve the etiology of this distressing disorder no direct effort has been made in this connection, so far as the author knows, to analyze either the physiologic difficulties involved in speech development, or the bearing on the problem of the psychology of the speech developing child. And yet certainly more than 95 per cent of the cases of stammering develop during the period when the young child is struggling to gain control of the complex speech function. These psycho-physical developmental processes of the speech development period involve not only the creation of new thought processes and of language for their expression, but also coincidentally the acquirement of a knowledge of, and skill in using, the peripheral physical apparatus for the expression of these new thoughts in words. Any one of these processes alone would be a matter of exceeding difficulty. Nature to be sure has provided so well for them, and, especially, has provided such an abundance of time for their full maturing, that as a rule they ultimately, after several years of effort, attain to practical success. But not always. Students of speech subjects are all familiar with that class of partial failures in speech development exemplified by the various forms of articulative imperfection. This class of failure is in its simplest manner of manifestation by no means uncommon, and is common enough even in its grosser forms of manifestation.

The etiological factors tending to upset Nature's carefully laid purpose for successful articulative development are usually physical in character and related either to impairment of normal, cerebral, or peripheral, physiology. But apart from these evidently organic etiological factors others more obscure and of a seemingly functional nature also exist. They lead to a relatively mild but sustained and probably often essentially accidental, psychical disturbance of physiology, sufficient to cause milder articulative imperfections in the development of speech. It is here that the etiology of articulative imperfections in speech development approach closer to the etiological factors producing stammering. For stammering,

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in the author's view, is to be classified frankly side by side with the articulative disorders, as another, albeit quite different, manner of upset in Nature's well laid plan for normal speech development. And this statement is made with full realization of the fact that stammering is also rarely incited later in life, even as, through cerebral or peripheral disorders, articulative disturbances also may rarely supervene at a later life period.

PART I. UNDERLYING PHYSIOLOGICAL AND PSYCHOLOGICAL
CONSIDERATIONS.

Definition and Characteristics. To the observer stammering presents itself as a series of abrupt holdings, repetitions, and stoppages in the speech, through which the natural smooth flow of words is interfered with or the speech completely blocked. To the sufferer, stammering consists on its peripheral side in successive muscular tensions and spasms somewhere in the region of the peripheral musculature of speech; and on its central side in more or less profound psychical disturbance. The articulative disorders of speech are fixed and unvarying almost regardless of time, place or circumstance. Stammering, however, is characteristically variable both as to occurrence, or non-occurrence, and as to intensity, depending on circumstances. Its manifestations may be almost, or even, at any rate so far as outward evidence is concerned, completely, in abeyance even for hours at a stretch. One may roughly in this connection compare the disorder of stammering with that of hay fever. An understanding of the latter disorder involves a differentiation into (1) An underlying peculiar susceptibility of the nasal mucosa to irritation; (2) Influences which incite this susceptibility to irritation into activity, and (3) the characteristic manifestations of the disorder. And likewise with stammering, an understanding of which demands differentiation of the phenomena of the disorder into: (1) An underlying susceptibility to the characteristic disturbance of speech; (2) influences which incite the stammering into activity, and (3) the characteristic manifestations in talking.

The most striking fact concerning the excitation of the underlying susceptibility in an individual subject to stammering is the absence of disturbance of speech when the stammerer is reading, or talking to himself alone, or to his horse, or dog, or to very young children (if older persons be not within hearing distance). Exceptions to this almost absolute fact are uncommon, and, when exceptions do occur, the stammering is reduced to a mere pittance of its usual character. This great fact, that the presence of older children, or adult persons, is required for the awakening of the underlying

susceptibility to stammering, holds practically universally. Not only that, but the disorder varies characteristically both in frequency and intensity with the social circumstances, the personnel of the social group, the subject matter of the conversation, and the temporary physical and mental status of the stammerer himself. He may talk to one person with almost no tendency to stammer, and to another be quite unable to talk without severe manifestations, and this marked influence of these two personalities on the stammerer may go on through an indefinite period of time. Under certain circumstances the sufferer may talk smoothly to certain persons, and under other circumstances he may with the same persons stammer seriously. The susceptibility to stammering is, then, aroused only when talking to people, and is aroused variably in conformance with altered personnel of the conversers and with altered conversational circumstances.

Talking in whisper and singing are usually stammer free, without, so far as the author knows, much reference to surrounding circumstances. No class of persons, and no nationality (in so far as the nationalities have been observed in this connection) are stammer free. Females are much less subject to the disorder than males. No manner of personality is exempt from attack, although temperamental characteristics influence the development of the underlying susceptibility.

Considerations Respecting the Peripheral Phenomena of Stammering. Among students of stammering the custom has been universal, I believe, to discuss the physical phenomena of the disorder in terms of sounds. An author, for example, may speak of stammering "in passing from the B to the O sound," and the like. Nothing could be better calculated to bring about vagueness of apprehension where exactness is necessary to clear understanding. Spoken sounds, or spoken words are not in themselves muscular movements, but are the result of muscular movements. This muscular effort is exceedingly complex, quickly performed, exact, and delicate. Clearness of thought demands that we think in terms capable of visualizing the perverted muscular phenomena, and not in terms which but vaguely suggest such phenomena.

"Stammering" as a technical term applied to the definite physiological disturbances designated by that term, has no application excepting where actual peripheral muscular action undergoes perversion. In other words in "stammering" a peripheral attempt at speech is made and this attempt is perverted by distorted muscular action. This disturbance of action affecting the muscle itself is

the phenomenon which characterizes stammering. Suppose, for example, that through physical disturbance the proper neurological command to the peripheral apparatus of speech be not forthcoming, and no word or sound ensue, if this phenomenon be not accompanied by peripheral disturbed muscular effort the act is not "stammering." In some stammerers an effort to talk, attended with profound psychical disturbance, may be abortive; if the effort to talk were persisted in a decided muscular struggle would inevitably result; the absence of such struggle is not evidence that stammering occurs without muscular disturbance; it is evidence, merely, of the realization on the part of the stammerer of what must ensue if effort to talk is continued, and the consequent inhibition for the time of the effort to talk. After all, it is this perverted muscular phenomena which has to be explained. No amount of mere psychical disturbance as such can possibly constitute an explanation of stammering, unless the connection between psychical disturbance and peripheral muscular perversion be also made clear. Stammering is certainly not a purely psychical disorder. The application of presumed psychical disturbance to the peripheral muscular disturbance is the key which has been but vaguely conceived and which may be able to help to open the lock of etiological understanding.

Considerations Respecting the Peripheral Physiology of Speech. Remembering that stammering consists physically in spasmodic muscular disturbance of normal action in the peripheral speech territory, it will be necessary to examine more carefully into the nature of the muscular processes of speech. The production of any spoken sound involves four classes of muscular action: (1) Compression of the chest upon the lungs; (2) placement of the articulative organs of the mouth (including the soft palate) into their proper mould-positions required to produce the sound to be enunciated; (3) the placement and bracing of the larynx (by the extrinsic muscles) for the particular work to be done, and (4) the approximation (by the intrinsic muscles) of the vocal cords.

In this connection the first important consideration from the standpoint of stammering has reference to the peculiar and important relation in action between the articulative mechanism of speech and the extrinsic and the intrinsic mechanisms of the larynx. The employment in speech of these three in a measure distinct mechanisms occurs necessarily in series in the order, (1) articulative, (2) extrinsic-laryngeal, and (3) intrinsic-laryngeal. This action in series is required primarily because of the intimate muscular relation between the hyoid bone and the base of the tongue.

Until the position of the tongue for the particular articulative mould has been determined the extrinsic muscles of the larynx cannot know the kind of action required of them for the bracing of the larynx; and until the body of the larynx, including the thyroid and cricoid cartilages, has become firmly braced the intrinsic muscles are not able to act normally. Also, since the action of all these three mechanisms is useless without the more fundamental compression of the air in the lungs for its action on the vocal cords, the series action (a form of co-ordination) may be considered to consist of (1) chest compression, (2) articulative mould formation, (3) extrinsic laryngeal fixation, (4) approximation of vocal cords. Other reasons, not to be taken up here, tend to confirm this idea that the series action takes its beginning with the chest musculature; apparently the articulative and laryngeal mechanism await the cue afforded by the compression of the chest. This action in series of the musculature of the speech apparatus necessitates of course that the underlying psycho-neurologic excitation should also be in series. It is for the exact placement of these wonderfully complex movements in speech that very much of five or more years of the child's life are required.

The second important consideration with reference to the peripheral musculature has reference to the possibilities of action of each of the four peripheral mechanisms and also of the soft palate with respect to (a) the capability of each mechanism to act independently of its fellows, and (b) the capability of each to act by conscious, voluntary control.

The chest is capable of conscious compressive control independently of speech production. The mouth organs (tongue, lower jaw) are capable of general conscious control, and, although they cannot be placed for every mould without thinking of the sound to be produced, the intensity of their action in any mould position is consciously controllable. The complete closing of the vocal cords is consciously possible without thinking of producing a sound, especially in connection with chest compression. This action comes much into employment in the act of coughing. The fixation of the larynx by the extrinsic laryngeal muscles is impossible without thinking of producing sound but the intensity of muscular action in the process of fixation is largely controllable. Of the speech musculature there remains only that of the soft palate, and this organ cannot ordinarily be moved consciously, excepting through thinking of a sound to be produced (excepting in swallowing and gargling) and the action of its musculature cannot directly be con-

sciously altered in intensity during the production of a sound. This exceptional incapability of voluntary holding in respect to the soft palate seems to throw light on the nature of the peripheral muscular disturbance in stammering and will be referred to later.

Each peripheral mechanism supplies its own force through action of its own muscles—chest, mouth, palate, larynx extrinsic and larynx intrinsic—and each mechanism is, to the extent we have seen, capable of acting out of harmony with the others. All peripheral movements must for correct speech production be accomplished instantly, delicately, accurately, and with great rapidity. Now if overaction from whatever cause be applied to one mechanism, or to a muscle group within one mechanism, this overaction interferes with the required instant production of the next act in the series, and thus the series-action required for speech production for the moment fails of complete realization and the machine becomes disturbed in action, or blocked. Thus is explained in a general manner the mechanics of stammering. For, a holding in any part of the speech machine effectually interferes with the action for word production of the other parts, wherever that inco-ordination may occur.

Concerning the Psychology of the Speech Development Period. The child exists in a world of objects and activities, which, through the entering channels of the sense organs, are continually impressing the potentiality capable, but still undeveloped and unimpressed, childish mind. Step by step the auditory word center begins to become charged with the sounds of the language, at first with extremely crude impressions. The action of the peripheral organs of speech is initiated at the very beginning of life, when breathing and swallowing and crying, and, later, babbling, constitute the child's natural activities. Even the systematized serial action of the complex speech machine is exercised a little later, by the playful effort at imitation of his own sounds, even before attempt at imitation of spoken words has begun. But only at this point, when the child actually attempts to produce the words he hears, does the education of the motor word center properly begin. It is the function of this center to store the memories of the neuro-muscular acts required for the production of spoken sounds, syllables, and words.

From these primitive primary conditions, when the childish mind is feeling crudely its own self-consciousness, as well as its relationship to the outer world, when the store rooms of the brain are well nigh empty of ideas, that the potential possibilities of the cerebral centers for speech and of the peripheral organs of speech,

enter on their processes of education and development. The problem is for the child to re-create on his own physical apparatus the same sounds he hears produced on others constructed almost identically like his own. And so the learning to play his own speech apparatus under these initially difficult conditions becomes the chief purpose of the early years of the child's life. By close observation one may become cognizant of the struggle of the child as he stumbles along in his early efforts to materialize his thought into words. The memories of the auditory word center are crude, or lacking, the development of the mind is primitive, the motor word center is relatively blank, the capability of attention is childish, and, perhaps above all, the peripheral musculature is clumsy, complex in its requirements, and untrained for its work. The struggle and persistence required for speech development is best appreciated by realizing the number of years of constant effort ordinarily required for its accomplishment.

This period of years involves, also, as has been suggested, the process of establishing the child's realization of himself and the world he has been ushered into. It is a period of peculiarly confusional psychology. It is a period when knowledge, experience, and capability of reasoning are lacking, a period when most things are doubtful and mysterious because not understood; a period of inability to measure relations and events truly; a period of exaggerations, when a molehill of difficulty appears like a mountain, because relative sizes cannot be measured; a period when the very atmosphere is peopled with apprehensions; when almost everything presents its own mystery and consequent fear; and it is of course, consequently a period of ready susceptibility to psychological disturbance.

The processes of speech development are so instinctive as to be almost as imperative as eating, and even as imperative as walking. In this generally sub-conscious process of development of the speech conscious effort has also a part, but of just what character and degree is hard to determine. Probably this conscious effort is applied chiefly towards a vague attempt at exactness of imitation, and is more manifest in accordance with definiteness of such effort; and it plays a larger part as the child grows older, and the pronunciation approaches nearer to normal. This conscious effort is comparable, with the childishness of the effort and the active imitative instincts well in mind, to the effort at correctness of pronunciation required by the adult for the learning of a new language. Its object is not directly muscular control, but the attainment of stand-

ards of sounds; consequently the neuro-muscular acts of speech are not impressed on the mind. The child attains to the particular sound without acquiring a knowledge of the muscular acts which produce it. Such conscious effort is concerned almost solely with the articulative processes.

The instinct to express the childish experiences, desires, and thoughts keeps in constant effort this complex process of speech development. The psycho-neurologico-muscular memories grow more and more true and more and more deep. The speech is becoming the constantly active medium for thinking and for the expression of thinking. As the psycho-neurological grooves become permanent and are repeated in exactly the same way with each repetition, the memories become deeper and deeper. Before the seventh of eighth year ordinarily such speech memories may, through the acquirement of marked deafness, be quite quickly forgotten. After that period they have become more fixed and permanent. Before that period, progressively backwards in the direction of the beginnings of speech, these partly developed speech processes and memories are much more ready of disturbance; and forward beyond that period are progressively less ready of disturbance. Stammering represents one of the very few disorders capable of producing permanent disruption of this process of development. It creeps in usually when the processes of speech are extremely crude, a few months, or a year, or two years, or a few years, after the speech has been begun, and fastens itself like a blight on this wonderful natural function. What is it and how does it get its terrible blighting hold, is our problem?

The Emotions of Social Intercourse. Emotional perturbation due to the social interrelations of life, so far from being confined to stammerers, is a great fundamental fact in human life, and to some degree is universal in men regardless of stammering. Indeed this emotional perturbation of social intercourse is so common as to be accepted as a matter of course, and as hardly calling for psychological analysis. And yet this human characteristic or, perhaps one should say, this human weakness, plays a profoundly important part in the lives and affairs of human beings. Its importance, however, can in the nature of things be clearly evident only to those who suffer most seriously from it, and whose knowledge is therefore obtained through introspection. Only the severe sufferers are able to clearly realize its nature and the profundity of its influence. For its activity is subtle, is mental, is exercised from within, and is apt to show outwardly only its superficial manifesta-

tions. Indeed attempt at concealment by the sufferer is so characteristic as to constitute one of the manifestations of the disturbance. We shall call this phenomenon "the emotion engendered by social interrelations," or, for short, "social emotion."

Naturally if this emotional phenomenon plays so important a part in human relations it must be generally known, at any rate superficially, and that is true. Under different circumstances we call it "shyness," "embarrassment," or "stage fright." The content and manner of manifestation of "social emotion" is best studied in the highly susceptible adult individual, who does not stammer. Speaking now of the marked but not unusual manifestation of this disturbance one notices as its foundation an altered state of mind. Let us grant to any individual who is highly susceptible to social emotion a certain status of mental habit and content and activity which is natural to him. In this unperturbed mental state the mind acts normally. Mental clearness, memory, capability of attention, self-confidence, self-control, will, feelings, ease of manner and of conversation, initiative, all proceed naturally and without uneasiness. And, yet, in a moment this entire normality of mental content and activity may become through "social emotion" profoundly altered. The mind now is in a profound *status of emotion* of serious importance. This perversion of the mental state is not at all imagined, or unreal; it is a dominating reality. The individual has become mentally an altered person. He is now thoroughly ill at ease, being highly overwrought by his realization of what he knows must be a repetition of what he has suffered many times before. Whereas normally his mind has been free to attend to any process of thought upon which it might be focussed, now the emotional "self-consciousness" compels direction of the mind on this very emotional disturbance. Mental clearness, memory, capability of attention, self-confidence, self-control, will, feelings, ease of manner and of conversation, are all seriously clouded and impaired by the dominating emotion. It is as if the capillary circulation to the brain may have for the moment become clogged, thus disturbing and clouding all central cell activity; and this tentative theory of causation, if considered seriously, may not, in view of the well known emotional phenomenon of blushing, be so far out of the way. The personality has lost its natural self-governing poise; it lies beneath, weighed down by emotion; realization that this state has resulted because of a deeply seated influence exerted by another person, or by demands of the social situation, is tantalizing; timidity is prominent; realization of the innate lack of self-poise and

strength and self-confidence, and that this cringing is, or may become, known to others in the social group, intensifies the emotion. The will is perturbed and vacillating, being not very easy of guidance. The initiation of speech is often difficult, and the emotion may actually prevent speaking, either through failure of the memories, or inhibition of the will, or tenseness of peripheral musculature. In another moment, if the social circumstances change, the emotion may vanish, leaving only evidence of strain on the nervous organization. The whole process may be repeated over and over endlessly through the years. When the individual is alone the idea of emotional disturbance is so far removed from the then normal state of mind as to seem almost impossible of occurrence.

The incitement into activity of the underlying susceptibility to "social emotion" is brought about by environmental conditions which play subtly on the emotionally highly sensitive and highly apprehensive nature of the individual. In a certain environment it may be entirely absent, unless aroused by the interjection of new circumstances. The susceptibility lies quite dormant when in association with some individuals, but is overmasteringly aroused by others. Familiarity with circumstances tends to mitigate its manifestations. Social intercourse, however, is in general rendered very trying. Reciting in school or college is especially difficult.

The phenomenon seems to have a congenital origin and to be deeply interwoven into the very nature of the individual. Widely variant degrees of intensity of the disturbance are observable in the same and in different individuals. Some persons are very little susceptible although none are wholly free from susceptibility. Susceptibility begins at least as early as the third year, is marked through childhood and youth and young manhood; but as the years bring wider experience and easy capability for the meeting of the duties of life, and bring a clearer understanding of people and their interrelations, the susceptibility to social emotion very gradually becomes buried in the more settled personality of the individual. But this commonly requires more than three quarters of the normal span of life. To those individuals not highly susceptible the gravity here placed on the phenomenon will seem exaggerated, but those who are highly susceptible will know that the gravity and profundity of influence on life of social emotion at its greatest intensity *cannot* be exaggerated.

If, under the influence of "social emotion," the mental processes are so seriously disturbed, such disturbance would be expected to react on the bodily movements engendered by the emotionally dis-

turbed mind. The physical awkwardness of an embarrassed person is thus accounted for; such a person has not full command of his movements, and the musculature is not easily controlled. The novice who walks across a large room before the eyes of people is swayed by social emotion; the muscle sense which determines the correctness of effort is disturbed, and so the correct placement of the leg becomes uncertain. The emotionally susceptible surgeon, operating before a group of persons may perceive a trembling of the operating hands; the steadiness of action, usually so secure, is wavering. If the emotionally perturbed individual talks, the muscles of the throat may become so tense as to render speaking difficult and the voice strained and unnatural. I have in mind an especially striking life-long example of this character in a highly sensitive, highly educated man now of fifty-six years. Public singers are much troubled by this muscle strain in the throat. The effect of social emotion on the muscles of the lips during speech is one of the most striking of these muscular phenomena. The lips become swollen, their feeling becomes unnatural, "woody," and their control in speech is difficult. This disturbance is especially trying to the sufferer because it makes his embarrassment more evident to others. In some stammerers one finds this disturbed action of the lips in talking also carried along, as it seems, into the anterior part of the tongue.

PART II. A STUDY INTO THE NATURE AND ORIGIN OF THE
PHENOMENA OF STAMMERING.

The facts of determining importance thus far brought out are: (1) The dependence of the arousing of the susceptibility to stammering on the presence of other persons; (2) the initiation of the disorder in most cases not at the very beginning of speech but during the early months or years of the period of speech development; (3) the impulsive, immature, unreasoning, apprehensive, emotional character of the child's mental activities; (4) the unsettled, wabbly, half-developed state of both the mental and physical processes of speech in the young child; (5) the great complexity and the action-in-series of the peripheral musculature of speech; (6) the possibility of conscious overaction in any one of the divisions of the peripheral musculature, excepting that of the soft palate; (7) the psychologic effects and the importance of the phenomena of "social emotion." The chief problems to be inquired into are: (1) The origin and nature of the susceptibility to stammering, and (2) the causes which arouse the susceptibility into action. For convenience the second of these two problems will be approached first.

The Excitation of the Underlying Susceptibility to Stammering Into Activity. All of the above reference to the phenomena of "social emotion" would have no place in this study if it had not a definite bearing on stammering. First, let it be understood that the perturbed state of mind of the stammerer is identical to the minutest detail to that of the "social emotion" of the non-stammerer. In other words, when the stammerer stammers his state of mind is identical with that of the non-stammerer who is experiencing the emotional disturbance described as "social emotion." This is the author's observation. Other writers on stammering commonly speak of the stammerer's emotion, but it is the author's desire to clearly identify "social emotion" as a universal human phenomenon, and to point out the exact identity of this phenomenon with the mental disturbance of the stammerer, and, furthermore, to point out the presence or absence, the severity or lightness, of the stammering, in precise accord with the conditions which increase or diminish "social emotion" in the non-stammerer.

Other writers, notably Dr. H. Gutzmann, lay much stress upon stammering as a *producer* of emotion, but deny its causative relation to stammering. However, Dr. Gutzmann admits freely the influence of emotion in increasing the intensity of the disorder, although, as I have said, denying its fundamental causative influence. This author analyzes at length the causes of stammering.¹ He finds psychical causes clearly present in, (1) stammering following intense emotional excitement (intense fright or anxiety, for example), and (2) psychical contagion (imitation). In general, however, he agrees with Kusmaul, whose disciple he is, that "stammering is an involuntary spastic co-ordination neurosis." He is certain with many other authors that stammering is often closely involved in psychical disturbance but generally the disorder is, he believes, not a psychosis but is a "co-ordination neurosis," although he does not offer an explanation for the neurosis. He does offer, however, certain "predisposing causes" for such a neurosis, which, however, he realizes, are present in only a part of the cases. For example, unusual temperamental excitability, and excessive rapidity of thought as compared with the slow ability to peripheral speech production, leading to confusion of peripheral speech action. This is good so far as it goes, but it does not go far enough either backwards into the psychical direction, or forwards deep enough into the peripheral end of the speech physiology. During his entire discussion this author impresses one as strenuously attempt-

(1) Sprachheilkunde. Berlin, 1912, p. 373 and following.

ing to escape from the emotional causative net which his own reasoning keeps involving him in deeper and deeper. When thoroughly interwoven in the net he yet finds a loophole of a relatively unimportant fact through which to crawl out.

In the first place Dr. Gutzmann gives no clear realization on the etiological side of the highly significant variations in the circumstances under which the manifestations of stammering occur, and especially leaves unmentioned in the causative connection the crucial fact that when not in the presence of other persons stammering is always practically in abeyance. He gives no evidence of his realization of the existence of important definite emotional phenomena arising in non-stammerers through social relations, although he recognizes "depressive emotion," meaning embarrassment and the like. He believes that stammerers are not ordinarily in childhood in a state of emotion, and lays great importance on the fact that certain adult stammerers in his acquaintance have declared to him the absence of emotion during their stammering. And yet he fails to ask or answer the question which would help so much to settle the point at issue, do these individuals stammer when talking or reading to themselves alone, or to dogs, or young children; or in general does their stammering vary as to circumstances, which manner of variation might demonstrate its dependence on the changing social circumstances? Moreover Dr. Gutzmann does not give evidence of realizing at all that stammering which had had as its ultimate cause a fundamental emotion might continue as a life habit, for years after maturity had practically banished the earlier emotional states. Nor does this author note the tendency of emotional people to conceal the existence of their emotion, which seems to them to speak for humiliation. One must ask also how Dr. Gutzmann knows that children do not experience embarrassment, even when this is not outwardly evident? Children often even struggle to conceal their emotion. Here again he omits the one test which would doubtless disprove his observation, does the child stammer when talking to himself alone?

But Dr. Gutzmann finds "depressive emotion" in stammerers in abundance, but chiefly as a *result* of the stammering. And yet he grants at any rate a subordinate effect of emotion in producing stammering in certain relations. "Embarrassment caused by reciting alone before his fellows is capable of making small abnormalities more pronounced"¹—thus social emotion may increase the intensity of stammering, although it may not initiate it. And yet under

(1) Ibid. p. 378.

circumstances incapable of arousing social emotion in this child, he would not stammer—especially when every vestige of emotional cause were removed, as when he were talking alone to himself or to his dog. Dr. Gutzmann is compelled to emphasize the marked incitation of stammering, as well as its increase in intensity during the first school year, and is puzzled by it. But is not this step—the passing from out the protection of the home into the great outer world—one of the crucial steps in the life of the child? In the especially susceptible it commonly constitutes a notable period of increase in “social emotion.” “Character, predisposition, anxiety, bashfulness, embarrassment and timidity constitute strong predispositions to speech trouble. A person who is anxious and timid will never speak so finely as one of courage and self-confidence. While it is undoubtedly certain that such peculiarities of character are developed from speech disorders, it is also true that the speech disturbance may itself be secondary.”¹ At last, even against all effort to hold the bag tight, the cat is out—“speech disturbance” may result from “social emotion.”

Having granted the existence of a disposition to stammer in any individual Dr. Gutzmann freely admits that the stammering may be intensified even to the point of dumbness by the “depressive emotion” induced by the difficulty in talking. “I ask a child his name and he answers M-M-Max Schulze. I act as if I had not understood and have the answer repeated. Now the stammering on the M endures longer. And I press the child for a third time to tell his name, and it may happen that he actually cannot speak, that the spasm has become so intense that he remains holding and is dumb.” With curious blindness to both fact and logic, with rigid inflexibility of attitude apparently due to a preconceived opinion, Dr. Gutzmann refuses to admit that the cause which he is certain intensifies the stammering in this child could not have been the occasion of inducing the stammering when the child *first* spoke. Does the author presume that the child experienced no embarrassment before he uttered his *first* reply? For, even according to the author he would in that case, being susceptible to stammering, presumably show some tendency to stammer. Thus Dr. Gutzmann’s reasoning becomes based on so fine a presumptive thread that clear vision must rule that it does not (at any rate in this example) exist. Does the author not know that the same child could go at once out into the yard away from all persons and speak freely a hundred times without the shadow of hesitation? But at once in the pres-

(1) Ibid. p. 378.

ence of the great physician that his natural ease of mind and body are more or less tied down by emotional perturbation?

"One finds numerous stammerers in the schools, when all the psychic causes exist which ordinarily increase the stammering, who talk excellently"—therefore this stammering is not psychogenetic. "It happens with children that stammering occurs with friends and play-fellows but is in abeyance with teachers"—then, since, in a group of children susceptible to stammering, when the social circumstances capable of arousing emotion are identical for each child, some stammer and others do not, therefore the stammering is not aroused by emotion—such is his argument.

From my own experience with stammerers I could bring almost endless pictures of similar peculiarities. For example, one stammerer talks to me with complete freedom from stammering, while another stammers at his worst. A brother and sister both stammer; the brother stammers scarcely at all while at home, and yet the sister under the same circumstances experiences her greatest difficulty. Precisely similar occurrences are common in non-stammerers who are subject to "social emotion." Turning for a moment to manifestations of emotion without the realm of speech, one notes that a certain individual promptly faints away when he sees an accident on the street; another finds it unthinkable to faint under the same circumstances. The explanation is clearly accounted for by the complexity of human physiology and psychology. Likewise if we were built alike there would be no differences of sex emotionalism, thus leading to infinite clashing in the struggle to possess the same man or the same woman, and so on without end. How, let us ask Dr. Gutzmann, could it possibly occur, that, of two stammerers, one habitually, time after time, reacts to the same circumstances differently from the other, one stammering and the other not, excepting through different emotional states set up in each of the two stammerers?

The excitation of emotion is determined by the peculiarities in the personality, in the experiences of the individual, and in the temporary, or lasting, physical and nervous normality or disturbed normality, of the individual. No two persons can possibly be emotionalized always by exactly the same circumstances. If all stammerers were incited to stammer by identically the same circumstances we conclude that stammering could not be caused by emotion. In other words the very facts which Dr. Gutzmann here advances in condemnation of this emotion-genetic theory are the very facts which incontrovertibly prove that theory. The stam-

merer goes about the world praying that he may not meet with conditions which arouse his "social emotion," for if he does not he will not stammer. It is highly characteristic (two typical examples flash into my mind as I write) that certain lightly susceptible individuals stammer objectively almost not at all excepting under certain conditions which deeply arouse their social apprehensions. In each of the cases in mind stammering practically never occurs excepting when called upon to recite in, not all, but in only a certain one, of their high school classes; and this is a practically regular experience. How characteristic this is of emotion; and what else could possibly explain the difficulty in talking? These two boys experienced concealed difficulties in talking under less trying circumstances—neither was an extreme subject of "social emotion"—but the uncontrollable outbreaks appeared only when the extreme emotional tests arose.

Now, in order to clinch in an unbreakable chain of fact, his belief that the Kussmaul conception—that "stammering is a co-ordination neurosis, resting on a congenitally excitable (reizbaren) weakness of the articulative apparatus"—Dr. Gutzmann triumphantly brings forward certain recent discoveries of "the newer application of experimental phonetics." Thus he and others have learned that stammerers do not control the chest muscles in making long expirations so perfectly as non-stammerers. This fact proves the underlying "weakness" of the speech musculature. Likewise, when the application of the chest action to prolonged production of vowel sounds, a like relative imperfection of control in the stammerer occurs. One "finds clear evidence of weakening, one finds a light tremolo, an irregularity of strength, a lack of skill in holding the tone regularly on the voice pitch. Thus one may be easily convinced that even when a stammerer is evidently talking smoothly he makes imperfect movements. Yes, there are stammerers in whom actual hesitation (Anstoss) seldom occurs, and who apparently speak smoothly, but who suffer subjectively from their own imperfect manner of speech, and they are well aware of it."¹

Unless experiments upon human beings take carefully into consideration human factors which might subvert otherwise well founded conclusions they are clearly open to criticism. Throughout Dr. Gutzmann's argument he shows an obvious inappreciation of the severity and importance of social emotional phenomena outside of stammerers and in stammerers outside of their stammering. When one grasps the fact that muscular tension is practically always present in stammerers, that stammerers continually talk under the pain-

fully difficult sway of emotional muscular tension, and yet do not outwardly stammer, and when one remembers that stammerers have for years habitually talked with imperfect chest action, and, therefore, with wrongly trained musculature, he is prepared to fully discount the value of these experiments as bearing on etiology. And yet it is highly reasonable to believe that certain children do acquire command over the complex function of speech less perfectly than others, and that such a misfortune may have a bearing on the etiology of stammering. But such a developmental weakness must be demonstrated, if it is to be presented as a valuable etiological fact, before stammering has begun, and not after years of disturbed speech has rendered its diagnosis apart from stammering practically an impossibility.

Stammering, then, is a peculiar susceptibility to spasmodic disturbance of the peripheral musculature of speech, manifested under the influence of certain causes which arouse this susceptibility into activity. Once the susceptibility has become established two great excitation influences may act to a certain degree independently of each other, although they usually do in fact act interdependently. The more fundamental of these two exciting influences, and the one upon which stammering positively and distinctively rests, in the author's view, is the phenomenon of "social emotion"; and the other is the *habit* of wrongness of psycho-neuro-muscular action, determined by the repetitive character of the disorder. The habit factor can be more clearly discussed at a later point in this study.

The Origin of the Susceptibility to Stammering. The more fundamental problem, that relating to the origination of the susceptibility to stammering, is made very difficult because opportunity to study the very beginnings of this disturbance of the speech are scarce, and these opportunities are also not of sufficient closeness and duration for the solution of so difficult a problem. I have seen probably scarcely more than a half dozen children in whom the stammering has been known to have endured for less than one month, and then I have not had the opportunity for the close and even in these cases persistent observation of these children demanded by the difficulties of the problem.

The initiation of stammering occurs only with rarity at the very beginnings of speech. The susceptibility to the disorder is for some reason superimposed on the already normally acting developmental processes of speech production. What is it and why is it that such spasmodic tendency appears in these normally acting developmental processes? If Dr. Gutzmann should question the statement that the developmental processes of speech were pro-

ceeding normally in the child who later, say at three or four or five years, begins to stammer, if he should persist in the assertion that in such children a "congenitally excitable weakness of the articulative apparatus" exists, he would still be under the necessity of explaining what forces serve now, after months or years of normal activity, to bring this so-called "excitable weakness" into active disturbance. We may never be able to prove or disprove, the existence of such weakness previous to the manifestations of stammering. One fact is, however, certain, namely, of all the children who seemingly might possess such "congenital weakness" of the peripheral speech musculature only an extremely small fraction ever enter on stammering. And, moreover, many children who seemingly do not possess such fundamental weakness do become stammerers. All of this tends to the conclusion that any theory as to the cause of stammering based on the conception of a fundamental weakness in the peripheral musculature is certainly, (1) on unsafe ground, and (2) is at best a partial explanation.

Let us not at this stage in the discussion lose track of certain basal facts relating to the child and to the disorder: (1) One of these facts concerns the uncertainty, the impulsiveness, the crudeness, the unreasoned immaturity, of all the psychical and muscular activities of the developing child. (2) Let us clearly recall also the fact that the muscular holdings of stammering are psychomechanical in origin. Whatever be the condition of tension or of vaso-motor disturbance in the peripheral musculature when the patient is not talking the spasmodic or pseudo-spasmodic holdings denoting stammering, occur only when the effort to speak has been set into action. (3) A childishly impulsive voluntary, or pseudo-voluntary holding, of the peripheral musculature during speech *might* be a factor in the incitation to stammering. This possibility will be discussed later. (4) Children are much more susceptible to "social emotion" than adults and from circumstances so slight as to be incapable of affecting the adult. (5) Whatever be the factors which incite the child into stammering these factors are themselves capable of, and in fact do habitually, undergo progressive increase in quickness of susceptibility to action, and also in intensity. Stammering is not only superimposed on the developing processes of speech, but the disordered processes on which the stammering depend themselves enter into this process of development. The beginnings of stammering which has become after a few years of the most extreme severity, may at the beginning have been too insignificant to cause any alarm. Unless one realizes this developmental factor in the disorder his picture of stammering is inadequate and untrue.

(To be continued.)

THREE REFLEX SIGNS USEFUL IN EXAMINING THE EARS FOR DEAFNESS.*

DR. OTTO J. STEIN, Chicago.

In the examination of individuals for the purpose of determining the presence of any remnant of hearing or in those who believe or wish others to believe there is no auditory function remaining, the expert otologist must at times resort to chicanery in addition to his carefully carried out and customarily used tests in an effort to find the presence of audition.

In studying some of the cases, the result of accidents for instance, where the question arises whether remaining hearing exists, especially where one is not materially aided by the individual's responses, or in very young children with delayed development of hearing, and in children who have apparently lost all their hearing from illness or otherwise, and who are too young, or mentally undeveloped to reply sufficiently to the usual test, in such cases every conceivable expedient must be employed to bring about an accurate status of the subject's hearing ability.

Many of the tests employed for determining the presence of hearing are inaccurate and too often carried out in a careless or haphazard manner. The results of the usual methods of examination depend entirely upon the subject's acknowledgment or negation of hearing. If he is too feeble-minded or indifferent to the tests, the results are inaccurate. If he is hysterical or is a malingerer the conclusions drawn are likely to be inaccurate.

In order to reach an opinion that is entirely not influenced by the subject's will or lack of will, there should be methods devised that in selected cases ignore the subjective expression completely and in place of them observations should be made upon other forms of manifestation. The reflexes may therefore be studied with more serious consideration than before.

The first two of the following three reflex signs as aids in detecting the presence of hearing have received my attention for some years. The third and latter sign is included here because it has been recognized by others and mentioned by them in the literature and also because it is a reflex of similar character to the two I have frequently observed.

*Read at the Twenty-fourth Annual Meeting of the American Academy of Ophthalmology and Oto-laryngology, October 16th, 17th and 18th, 1919, Cleveland, Ohio.

The three reflex tests are the

1. Auricular reflex.
2. Pupillary reflex.
3. Cochleopalpebral reflex.

The auricular reflex is concerned with the motions of the external ear or auricle when the ear is subjected to a sudden and sharp sound. The pupillary and cochleopalpebral reflexes are movements of the iris and eye-lids, respectively, occurring on the side under examination. In the performance of any of these tests it is important that they are made without the knowledge of the subject under examination. It is in addition necessary that various precautions be taken to eliminate other sources of excitation that might contribute to an erroneous interpretation of the tests.

The best objects with which to make the tests are a shrill whistle or a bell with a spring hammer, but even a C-2 tuning fork has been used. The sound emitting instrument used should be one giving forth a clear, sharp, loud penetrating sound. After being sounded it is held quickly opposite the auditory meatus of the side under investigation. But first the subject is faced to the side, with the opposite ear canal stopped and a blind placed beside the eye next to the ear under examination. When making the pupillary reflex test care should be taken to avoid extreme lighting conditions and variations in same. The patient's vision should be directed at a distance to avoid fixation changes of the pupil. Quiet should prevail and all suggestions of any nature that might excite psychic reflexes can easily be avoided.

In taking the auricular reflex a movement of the pinna, either as a whole or in part, takes place as soon as the sound strikes the ear. The muscles of the outer ear are very rudimentary in man, and consequently they are susceptible to only very slight movements ordinarily, but being accessories to the function of audition, as is well exemplified in the animal, they are keenly sensitive to all sounds and on stimulation will contract within the range of their ability. In some cases it is the superior muscle, called the *attolens aurem*, that perceptibly moves the ear upward, while in others the action of the anterior muscle or *attrahens aurem* is the stronger and the ear moves forward as well as upward, and more rarely does the posterior or *retrahens* muscle overact the others, but usually they act in unison, raising the auricle as a whole and thereby straightening out the flexible cartilaginous canal, permitting the sound to enter more readily. In addition to these three muscles there are six others that play a minor role in the hearing ability of man, but

nevertheless have an importance in this subject because of their focusing function. These six little muscles known as the tragus, antitragicus, helicia, major and minor, transversus auris and obliquus auris, pass from one part of the pinna to another as their names imply. By their contracting and relaxing they pick up every stray bit of sound floating about in the neighborhood of the ear and deflect it in a way so as to find ready passage down the auditory canal. Their action is never so manifest in one with good ordinary hearing, although still manifestly present in many people, but when the ability to hear is strained to the utmost these accessory muscles assert themselves and they seize upon every bit of sound in an endeavor to accentuate it and in that way their reflex action is brought to light more noticeably in the defective hearer than the normal. It is the stimulation of these nerves chiefly that results in the movements of the auricle. Just how the circuit is completed remains to be shown. My idea is that the sound stimulus is received within the ear by the auditory nerve filaments still functioning and then carried to the auditory nucleus. The approximation of the facial and vagus nerve nuclei is such that the stimulation is readily relayed by their motor fibers to the external muscles. The anastomosis of the remaining nerves that supply motion to the integument and the other and smaller ear muscles complete this amazing arrangements of nerve fibers that play such an important part in collecting sound waves and focusing the auditory tube for the greatest degree of sound conveyance.

The movements of the ear are but a part of the numerous changes affected by the muscles of facial expression. Take a child who has lost almost all of its hearing as the result of some disease like cerebrospinal meningitis for instance, and sound a note that it still hears sharply next to its ear and notice the play of the various muscles of expression, including those of the auricle in joyous manifestation of its recognition. The nerve supply of the ear constitutes an interesting network of anastomosis between six different nerves, chief of which is the facial nerve through its posterior auricular and temporal branches.

The normal pupillary reflexes consist of a contracting and dilating action of the respective fibers of the sphincter pupillæ. Various forms of stimuli affect the pupil of the eye and among these is sound vibration. The reflex stimulation from sound affects the pupil similar to the associated movements of convergence, accommodation and squinting by causing a contraction of the pupil. This would indicate that the nerve fibers of the oculo-motor nerve

were the particular ones affected, and it furthermore indicates why the winking of the cochleopalpebral reflex takes place under similar stimulation. In carrying out these tests it is assumed that any existing irregularities or vagaries of the pupil and lids has been carefully anticipated, otherwise the results would be misleading. It is also necessary that careful attention be given to the details in making the tests, for a neglect in some of the precautions will militate against a correct interpretation.

30 North Michigan Avenue.

X-RAY DIAGNOSIS OF A CASE OF ACUTE MASTOIDITIS WITH NO MASTOID SYMPTOMS.*

DR. HAROLD M. HAYS, New York City.

About the latter part of March, 1919, Mr. W. J. S., aged 39 years, developed what he thought was a mild case of the "flu," but he attended to his business as usual, and in a few days felt so well that he went on an automobile trip. The following day he developed a bad cold in the head and two days later while blowing his nose, violently, he felt that his left ear was stopped up. He consulted a specialist who asked him to return the next day, by which time the right ear became involved so that he was unable to hear well in either ear. The otologist told him that both ear drums were inflamed and kept him under preventive treatment. After about three weeks' treatment the left ear cleared up but the right ear continued to trouble him. He remained under observation for four days. At the time of the incision of the right drum, there was a discharge of a very slight amount of pus and blood, but this stopped almost immediately. While he was in the hospital he had no temperature and did not feel sick at any time. He had no pain in the ear, no pain over the mastoid region and no tenderness. He states that after he had left the hospital, a swelling appeared behind the ear to which he applied some ointment, which apparently relieved it. Then the canal became swollen but not painful. He states that during all this time he was considerably

*Presented at the Otological Section, New York Academy of Medicine, October, 1919.

hard of hearing, but otherwise did not experience any discomfort. From time to time during these few weeks he played his usual game of golf and went about his various duties without any particular worry about his ear except the feeling that there was something there that should not be there.

On May 26, 1919, the patient consulted me. Examination of the nose, throat and ear showed the following: There was a marked obstruction in the left side of the nose due to a spur which blocked up the entire inferior meatus, so that it was impossible to pass any instrument through this side of his nose. The right side of the nose was clear. Examination with the naso-pharyngoscope showed both Eustachian tube openings in good condition. The throat was negative. Examination of the left ear showed a normal canal and a slightly retracted drum with no evidence of any former inflammatory process. Hearing tests showed that the hearing acuity was diminished. The watch could be heard at about four inches. Rinné test was positive. Examination of the right ear showed a markedly stenosed canal which was so narrow that it was impossible to see the drum or even to pass a thin applicator into it. The patient did not complain of any tenderness in the canal which could point to a furunculosis. The hearing was practically negative to the watch on this ear. Rinné test was positive. Pressure over the mastoid elicited no tenderness even in the antral region. There was evidence of a slight degree of edema over the mastoid which could readily be associated with the canal condition.

Even with a history of the previous acute condition of the middle ear, it seemed to me that we were here dealing with a chronic inflammatory process of the canal wall. This opinion was further corroborated by the fact that Eustachian bougies were passed into the middle ear very readily, and when the ear was mildly inflated, the hearing was markedly improved for the time being.

During the course of the next two weeks I attempted, by all the usual means, to bring down the supposed inflammation of the canal wall, such as packing the canal with strips of gauze soaked in aluminum acetate solution and applying a solution of iodine and glycerine. At the end of two weeks I suggested that deep incisions be made in the posterior wall of the canal. This was done under ethyl-chloride anesthesia, and the canal tightly packed, but the procedure did not bring about any relief. I then suggested to the patient that he go away for a couple of weeks and forget about his ear condition, hoping that it would resolve by itself, but when he returned he had the same symptoms, mainly a stuffiness in the ear

and a peculiar feeling in the mastoid as if there was something there. During all this time he had no discharge from his ear, inflation showed the middle ear free from any acute diseased process, he had no temperature, did not feel ill in any way, no headache, no pain over the mastoid, and even deep pressure over the mastoid elicited no tenderness. In order to convince him that I was absolutely right in my contention that there was nothing serious the matter with him, I suggested that he have an X-ray picture of the mastoid taken by Dr. George S. Dixon.

The next day Dr. Dixon reported to me the following: "X-ray plates of Mr. W. J. S. show that the mastoid on the left side is normal. The cells are clearly outlined. The right mastoid shows cloudiness of the entire region with no distinction of the cells. I believe that this is an operative case."

On the strength of this report I had the patient consult Dr. Robert Lewis with me and, after talking the matter over, we came to the conclusion that it was best to do an exploratory mastoidectomy.

On the following day the patient was operated upon. As soon as the cortex was chiseled through, there was an immediate gush of foul smelling pus which seemed to be under considerable pressure. The entire mastoid was destroyed and a peri-sinus abscess, over an inch long, was uncovered. The antrum was completely closed off from the middle ear cavity and no attempt was made to bring about a connection between them. It was necessary to do a complete exenteration of the mastoid cells as the involvement went back to the post-sinus cells and into the tip. A small wick of iodoform gauze was placed in the antrum, and the wound closed, except for the lowest one-half inch. On the third day, the drain was removed and at the end of ten days the patient was discharged from the hospital with a completely healed wound.

This case is exceptionally interesting for a number of reasons, chiefly because it seemed advisable to do an exploratory operation on a probable diagnosis made by the X-ray picture. I have frequently stated in papers and at this Section, that the value of the X-ray as a means of diagnosis in mastoiditis will mainly be in its corroboration of clinical findings and that no one would be inclined to operate merely because the X-ray showed evidence of disease where there were no symptoms to warrant such operation. Even after seeing these X-ray plates I did not have enough evidence to state positively that the patient had mastoiditis, but it seemed to me (and this was the opinion of Dr. Lewis also) that the only fair thing to do under the circumstances was an exploratory operation.

One cannot doubt what my opinion was, even after operation had been decided upon, when I state that ten minutes before the operation I made the remark that this was almost the first time that I intended to open up a mastoid process when I felt reasonably sure that no diseased condition could be found. I cannot help feeling now that the taking of X-ray pictures of puzzling ear conditions is most necessary, and that it is possible that many so-called resolved ears, may leave a diseased condition in the mastoid which will go undiscovered unless such pictures are taken. This calls to my mind a case that I saw last March in which even more acute symptoms had been presented. Here again the X-ray picture, taken by Dr. Dixon, showed marked destruction of the mastoid cells. I advised operation but the patient left me to go to Dr. Whiting, who observed her for a few weeks and then decided that operation was not necessary. I do not hesitate to say that some day this patient will find herself in a serious condition; and possibly then the original mastoid condition will not be thought of. I am convinced that when sufficient destruction takes place to show clearly in X-ray pictures, there is no way for such a condition to clear up by itself. The best that we can expect is a latent abscess which may, of course, become sterile, but more likely, continues to erode bone until a sinus thrombosis, a brain abscess, or a meningitis results. I believe it is just that kind of a case that gives rise to those indefinite pyemias which Libman and Gruening and Oppenheimer reported some years ago.

Another point should be mentioned here. There are many men who attempt to take an X-ray picture of a mastoid, but there are few of them who take such exact pictures that we are able to see diseased condition ourselves. Moreover, there are few of them that are expert enough otologists to be able to discuss the fine points of the case with us. We should consider ourselves fortunate to have such men as Dixon and Law among us, and let me say here that it is seldom that Dr. Dixon gives an opinion on his X-ray findings, that that opinion is not substantiated at operation.

2178 Broadway.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOTOLOGY.

October 10, 1919.

X-Ray Diagnosis of a Case of Acute Mastoiditis with No Mastoid Symptoms. DR. HAROLD HAYS.

(Published in the present issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. SEYMOUR OPPENHEIMER said that he had seen a number of cases similar to the one presented by Dr. Hays, only in all of his cases there were some slight evidences of middle ear discharge, the ear not being normal as described by Dr. Hays. The explanation suggested for this was that the middle ear was walled off by an inflammatory process from the antrum.

Dr. Oppenheimer said all the cases he had seen were due to one particular type of organism, the streptococcus mucosus, and all the patients had a comparatively mild otitis, and the middle ear symptoms failed to show very much evidence of disease. The drum perforation healed or only a very fine perforation remained, and only a slight amount of discharge was present. He had seen several such cases in the hospital, and these returned some five or six weeks later complaining of post-mastoidal tenderness and stating that they did not feel completely well,—with a very mild degree of temperature and complaining possibly of slight headache or chilly sensation,—but with no discharge from the middle ear. On the strength of this tenderness coming on after the acute symptoms had subsided, he had advised a mastoid operation, and had been surprised to find the extent of the disease. The explanation lies in the curious vagaries of the streptococcus mucosus, and the walling off of the diseased space from the antrum proper.

DR. ROBERT L. LOUGHRAN said that the report of this case should be of value to all who heard it and inquired whether the oedema in the posterior canal wall should not have aroused suspicion as to the condition.

Was Dr. Hays able, on operation, to find the point from which this oedema in the canal wall started?

The cases reported by Dr. Oppenheimer were extremely interesting and recalled one seen with Dr. McKernon, in which such a middle ear condition occurred and persisted well back over the emissary vein and it was a question as to what it was. At operation the mastoid antrum was found to be clear, but, in further seeking the cause of the symptoms presented, the dissection was continued backward until a well developed abscess cavity was revealed.

A history was elicited from the mother of the patient, that two years previously, the child had an acute suppurative otitis media and the mastoid area had been poulticed, and a swelling about the size of a chestnut had developed, which entirely disappeared.

This swelling was, in all probability, an oedema associated with an abscess of the cells surrounding the emissary vein, which was absorbed to a great extent and two years later lighted up again.

DR. BRAUN said that the discussion reminded him of a case seen some six or eight years ago. The patient had been in bathing and someone had struck him on the ear with a stream of water from a hose and he developed an earache; he consulted an otologist and was under observation for three or four weeks. The otologist finally came to the conclusion that it was a neuralgic condition and turned the case over to a neurologist. The latter decided that it was not a neuralgia. When the case came under his observation some four weeks after the condition started, the picture was very similar to that described by Dr. Hays. The drum-membrane looked normal. The canal was somewhat narrowed and there was some diminution in hearing. It was not possible to make a diagnosis offhand, and it was thought best to watch the case for a while. Later, it was decided to do a paracentesis, and pus was obtained from the middle-ear. A mastoid operation was then performed, and a very much involved mastoid was found. Dr. Braun said that he agreed with Dr. Hays that the X-ray picture alone should not be used as an indication for operation. In the case reported by Dr. Hays, however, the non-tender narrowed canal and the diminution in hearing were very suggestive of mastoid involvement.

DR. ERNST DANZIGER said that all have seen cases where after an apparently light otitis media we get all the symptoms shown in this one, but that he had never seen a case where there was no pain on pressure, considering the amount of destruction found at operation. He could not but think,—especially as Dr. Hays had no data of the bacterial findings,—might possibly have been, not a case of acute infection, but of gumma of the mastoid.

DR. KAHN said that last year following the influenza epidemic he saw some very peculiar cases. Two of these had oedema following a discharge from the ear, and were diagnosed as acute processes of the middle ear, but there was no mastoid tenderness. We are all in the habit of diagnosing cases of mastoiditis by eliciting tenderness on pressure, and make a great point of that; we lay a great deal of stress upon tenderness over the mastoid. These two cases presented this discharge from the ear, such as is seen in cases of involvement of the middle ear; but the oedema was not only in the canal but also in the tissues back of the ear,—such as is seen in cases of furuncle of the canal,—and this oedema lasted for over a week. There was absolutely no tenderness of the mastoid, but both patients complained of continuous headache; whenever they were seen they said they felt pretty well excepting for the headache. One of the cases was followed closely at the New York Eye and Ear Infirmary, and later showed involvement of the very large cells along the sinus. These cells were opened and the patient got along very well for a while and then showed symptoms of meningitis. He was again admitted to the hospital and the question of whether or not he had a cerebellar abscess came up, and it was finally decided to do a cerebellar operation, but nothing was found. The patient made a complete recovery.

DR. HAYS said that before closing the discussion he would like to know if Dr. Oppenheimer did not agree with his contention about the possibility

of some of these pyemias being discovered in the medical wards being due to infections from a healed abscess of the ear or mastoid operated upon a year or more before. Some years ago Dr. Oppenheimer had published a paper and then said that he had elicited an old condition from a tell-tale scar on the drum, and upon operating on the mastoid found it in fairly good condition but giving evidence of an old thrombus.

DR. OPPENHEIMER said that Dr. Hays was absolutely correct in his recollection. Three years ago he had published a paper on metastatic conditions, complications of acute ear disease with arthritic symptoms, where for the time being the arthritic symptoms completely overshadowed the ear disease. A brief outline of one of these cases was as follows: a mild middle ear inflammation where all the symptoms cleared up; a few weeks later the patient complained of pain in one of his joints and was under observation for this, the condition being presumed to be an acute rheumatism. Finally, a surgeon was called to see the swollen knee-joint, and he declared that it was not a primary but a secondary process. It was then learned that five or six weeks previously the patient had this primary process and it had apparently cleared up. Examination showed that the man's drum was not quite normal but was somewhat thickened, and there was a pinpoint perforation. A blood culture was made and a bacteraemia was found, proving that the condition in the knee was a secondary manifestation. The mastoid was opened and the sigmoid sinus investigated. A thrombus was found running well down into the jugular vein.

DR. HAYS said that the most interesting point in this case was its obscurity. In the case that he had spoken of, the patient showed an absolute mastoiditis last spring; operation was advised, but she was not operated upon. The question is, what happens to a case like that? It was difficult to avoid thinking that such a case is sure to give trouble some time.

In regard to the furunculosis, Dr. Hays said that his first idea was that that was the trouble, and he treated the patient accordingly. He could not account for the lack of symptoms excepting that the middle ear was closed off from the mastoid cavity at the time of the operation,—and that the swelling of the canal was of a secondary reaction. After incising the canal wall, the wound was packed very tightly.

In regard to making a diagnosis from the X-ray picture: If this patient had not insisted that he had something the matter with his ear, Dr. Hays said he would not have worried about the case. Since he has been operated upon, the patient has been complaining of something of the same kind with the other ear and a picture was taken of that, but the pictures show absolutely nothing wrong. Of course, the condition in the other ear may be accounted for by his having a catarrhal process there, and that will be looked after when his nose is fixed up. The symptoms, however, of which he complains are the same as those in the other ear, and if one were guided by the symptoms alone one would be justified in thinking that the same thing was the matter with the other side. Dr. Hays said that he had many times before stated positively that he would not operate upon a mastoid simply on the evidence of the X-ray picture. Everyone would acknowledge that Dr. Lewis was a careful man,

—but the X-ray picture showed something, and the exploratory operation was justified by the result.

Report of a Case of Brain Abscess. DR. JOHN LESHURE.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

Recently Observed Intracranial Infections Complicating Mastoiditis.

DR. SAMUEL J. KOPETZKY, F. A. C. S.

(To appear in the December issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. MAYBAUM said that he was particularly interested in the case of sinus thrombosis associated with a cerebral abscess, not only as to the symptoms presented but in regard to the technique employed by Dr. Kopetsky. Dr. Kopetsky incised the lateral sinus, found a large thrombus which he regarded sterile, obtained free bleeding from the jugular and torcular ends, and plugged these ends. Dr. Maybaum questioned the advisability of such a procedure on the presumption that the clot was sterile. A lateral sinus sufficiently diseased to require such operative measures should indicate the need for ligation or resection of the jugular vein, as the case might be. One may be dealing with a parietal or complete clot in the jugular bulb or the jugular vein wall may have undergone any possible degree of inflammatory change. The outcome in Dr. Kopetsky's case was, fortunately, favorable. These facts had been forcibly impressed upon Dr. Maybaum's mind in a case in which a diagnosis of sinus phlebitis had been made. The lateral sinus was treated in a manner similar to that described by Dr. Kopetsky in his case. The jugular vein was not ligated. At a subsequent operation upon the jugular vein, a large abscess of the neck was uncovered, in which the jugular vein could no longer be identified. Each of the four cases of sinus thrombosis showed a perisinus abscess. Dr. Kopetsky had undoubtedly seen cases in which the inner plate covering the lateral sinus was normal in appearance, at least in the gross. Dr. Maybaum then cited such a case. Within a day or two after the mastoid operation symptoms of sinus thrombosis developed. Blood culture was positive. On reopening the mastoid, the inner plate still appeared normal, and this fact was confirmed by a number of men present at the time. No perisinus abscess was found. The sinus wall was not healthy in appearance. No clot was found on opening the sinus. The jugular vein was ligated. The patient made an uninterrupted recovery. This, undoubtedly, comes under the class of cases of osteo-phlebitic type of infection described by Dr. Kopetsky and others a few years ago.

Surprise had been expressed by one of the speakers at the absence of positive cultures in the four cases of Dr. Kopetsky. Dr. Maybaum did not consider this so very remarkable. While the majority of cases sooner or later do show a positive culture, occasionally cases of undoubted sinus thrombosis may give negative blood findings throughout their course.

DR. HAYS said that the variety of these cases made it impossible to discuss them individually. It was almost impossible for many men to collect such cases. Many points were brought to mind, however, which were very important. First, how many cases which are considered well after operation are really so after five or six days? It was almost impossible to fix any stated time when one could say that a case was well, until the

wound was absolutely healed and the patient free from temperature. Another question was, how much of the responsibility for complications of this kind was to be attributed to the nature of the infection and how much to an error in technique? For his own part he frankly confessed that in cases of sinus thrombosis where the technique of the first operation had not been satisfactory he had often been able to find some definite cause for the sinus thrombosis operation.

Such cases as Dr. Kopetsky had reported develop in many ways, and it was almost impossible to avoid feeling that in some way they might be due to the operation,—some infection, etc. Possibly the mastoid operation was not very thoroughly done, and where a sinus has been exposed there is much likelihood of having an infection develop; or possibly some injury to the vein may lead to a complication later on.

DR. JOHN GUTTMAN said that so far as the first case was concerned the symptoms enumerated,—with the exception that the blood culture was negative and that there was euphoria,—pointed toward sinus thrombosis, in spite of this the case went on for several weeks without being recognized as such. The effect of a negative blood culture is very misleading. If the blood culture is positive that can be relied upon, but the negative finding is not conclusive at all. Euphoria is one of the characteristic signs accompanying sinus thrombosis.

DR. KAHN said that all of the cases were very interesting, but those that appealed to him most were the brain abscess cases. Everyone recognizes the gravity of exploring the brain on insufficient symptoms. We are not able at present to so classify the various lesions of the brain as to be able always to recognize definitely whether the symptoms are caused by a cerebellar abscess, a temporo-sphenoidal abscess, or involvement of the sinus or something else. We do decompression operations and explore the subdural space, and go into the brain, and often do not discover anything. It would seem that we ought to proceed more along the line of trying to relieve the brain tension through some other means than of going through the dura without sufficient symptoms. Of course, the symptoms are sometimes definite and decided, but often they are so obscure that an exploration reveals nothing.

We should try to learn where our knowledge is lacking. What should we do then? How can we relieve this tension? Many cases can be relieved through spinal puncture. Dr. Kahn stated that he reported a case before this Section last season wherein he thought the symptoms were relieved by free bleeding from the lateral sinus. He believed that Dr. Kopetsky had referred to one case somewhat along this line. He believed that in many cases pressure in the brain was due to a passive hyperaemia, and that in reality there was a damming back of the venous circulation and that this might be relieved by directly bleeding through a vessel closely in contact with the brain, such as the lateral sinus.

DR. ALTMAN said that he felt like a stranger in a strange land, and did not feel that he could add to the discussion, but he had been impressed by the remarks of the last speaker. It was both true and sad that we often enter the cranial cavity and find nothing. Then, what shall we do,—what is the alternative? Medicine, and especially cranial surgery, is not a positive science as yet. We are still guided by symptoms, and when

symptoms are present which lead us to deduce that the cranial cavity is the seat of a lesion which is operable, then it is right and proper to explore it; but no man would go into the cranial cavity without careful and considerate deliberation.

Dr. Altman said that in the case where he had made the diagnosis of cerebral abscess, all symptoms pointed to this being the lesion, and nothing pointed to the presence of a sinus thrombosis.

The case presented a slow pulse, persistent headache, no temperature elevation and an excited sensorium. That exploration revealed a thrombosis was as much a surprise to him as to the surgeon, Dr. Kopetzky; and the essayist did well to report such a case to call attention to such data. Not to have explored, and thus found the thrombosis, would most probably have eventually resulted in the loss of the patient's life. However, it is to be remarked that no tyro should attempt surgery on the brain, while at the hands of an experienced man, no particular harm is done when the brain is carefully explored.

Finally, he remarked that, in the present state of our knowledge, we shall probably continue to have such cases, and shall continue to go into the brain upon symptoms such as this case presented as often as such conditions seem to demand it, and that he believed such procedures to be justified.

Dr. KOPETZKY expressed his appreciation of the manner in which the paper had been discussed. He stated that each of the cases reported could have been given in much greater detail than the rapid surgery which he had presented. The reason for each step, and the factors which determined the decision could have been made plain, but his idea had been simply to present a series of unusual cases that had occurred in the daily practice of otology. It would have been easy enough to report ordinary routine cases, where everything had been done "according to Hoyle," but he had taken the occasion to present these cases before an otological audience for the purpose of bringing out a discussion, and in an effort to gather the consensus of opinion to see whether something more could not be learned from these cases.

Regarding blood cultures, other cases had been under observation which gave positive cultures, and the fact is stressed that this series presented negative findings. Dr. Kopetzky said that he was operating in different hospitals, and he took it for granted that the men in the laboratory departments of these institutions were qualified men. They had found the blood positive in other cases, and were on the lookout for positive findings in the cases under discussion; and neither at the Beth Israel, the Park, or the Manhattan Eye and Ear Hospital, where these cases happened to be, did the bacteriologist report positive results.

The findings in the blood, just like any other laboratory aid, whether such aid be a radiogram or a laboratory report, is of value mostly when it substantiates a clinical picture. Negative findings should not usually be held to negative the diagnostic data which the clinical study of the case gives. Nor should such negative findings justify failure to proceed with surgery when there is sufficient clinical data at hand to warrant surgery. The cases are presented primarily from the clinician's standpoint; and they show how competent men differ in the interpretation

of the symptomatology, especially when the laboratory aids give little toward guidance. These are not theories, but facts which Dr. Kopetzky had to face in treating these cases.

Dr. Kopetzky said that he was, of course, aware of the stimulating effects of the streptococcus on the patient, and the exaggerated feeling of well-being which patients suffering from sinus thrombosis have, especially in the earlier stages of their illnesses. But he wanted to emphasize that factor, because it is so often misleading to those in medical attendance on these cases, so that they, too, will come to recognize this factor, and not oppose operative interference at the time when such intervention might give the patient the best chance of recovery.

Dr. Kopetzky said that he had no quarrel to present on the question of the terminology of disease; he believed in being up-to-date and when competent men have decided that there is a difference in the terms used, why not make use of them accordingly?

As to the relief of intracranial pressure by lumbar puncture in the case where decompression was employed followed by repeated lumbar puncture, in the case referred to there was not time to do this. The patient was suffering from an acutely mounting intracranial pressure, and it became imperative to relieve this at once. The urgency of the clinical picture allayed, then repeated lumbar punctures were carried out. He had the same impression of the case that Dr. Braun had. He believed that there was an intracranial lesion in process of rupture, and he, too, held that the mastoidectomy had no connection with what immediately followed. The decompression saved the man's life. However, it should be admitted that the decompression was done to afford means to search the brain for the lesion thought to be present. All are familiar with the Edelbohl's operation of stripping the capsule of the kidney to give room for the oedematous tissue to expand, and after the tension is relieved, the oedema subsides. This is exactly what happened in the case under discussion. In a few days the oedema of the brain-tissue had disappeared. Whether or not he is permanently cured, no one can say, but certainly his condition is relieved.

Replying to Dr. Danziger, Dr. Kopetzky said that the function of the labyrinth had been tested, and it had been found to function.

Replying to Dr. Maybaum's remarks, Dr. Kopetzky said that the doctor had misunderstood him in regard to the plugs. If, in a case of sinus thrombosis, you find a thrombus at the knee of the sinus and occupying that area, and you plug above and below it, and then incise and remove this thrombus, and then pull out the upper plug and have free bleeding, and then pull out the lower plug and have free bleeding, you can estimate that probably there is not thrombosis in the bulb. You have reached beyond the clot. If I am not sure of this, I resect or ligate the jugular vein. In this particular case, I got well beyond the clot. The patient never had any sepsis nor any rise in temperature. At any rate, the removal of the clot, which was aseptic, removed the symptoms, and the surgery accomplished the end sought.

The cases reported some years ago with a normal wall,—the osteophlebitic cases,—were of another sort. Where granulation tissue is thrown out on an exposed sinus, it is a protective measure, and the rule

is not to disturb such granulations, but to leave them alone. In the cases reported, that procedure was followed.

These cases are unusual in so far as they present perisinus abscesses which subsequently developed sinus thrombosis. Usually, unless cases of perisinus abscess are among cases which can be classified as neglected, or not properly handled no thrombosis results. It is rather in the haemorrhagic type of mastoiditis with the numerous small thrombotic veins which are found in the dividing walls between the mastoid cells, that sinus thrombosis develops.

Dr. Kopetzky said that he had sufficient confidence in the technique employed to be assured that the sinus was not damaged in any of the cases reported this evening.

For years he had followed Lane's teaching of exposing the dura in any case in which the mastoid involvement had been long drawn out. As Lane's reports show, many epidural abscesses have thus been uncovered, and Dr. Kopetzky feels warranted in following this procedure as routine in this class of cases. His experiences have verified Lane's contention, and although he has exposed dura and sinus thus, he has not had an unusual percentage of cases of thrombosis.

It is asked, "When is a patient out of danger?" He may be so considered when his wound is healing normally, and he is otherwise reacting normally to all ordinary stimuli.

He agreed with Dr. Kahn in deploring the shotgun method of hunting for a lesion in the brain, but as yet there was no chart by which one could go in and positively locate an abscess. The percentage of times when he had seen a brain abscess give focal symptoms which had helped had been sufficient to make him "celebrate" that event. The most that could be done was to say that there was a brain abscess, and go in and hunt for it. The most eminent neurologists have often concurred that the abscess was possibly there, and we, at operation, could not find it.

If surgery is regarded as a means of therapy, one can only use his best judgment and do the best possible under the circumstances, and hope that the patients will get well.

AMERICAN LARYNGOLOGICAL ASSOCIATION.

Abstract of the Report of the Scientific Proceedings of the Forty-first Annual Congress of the American Laryngological Association in the Congress of American Physicians and Surgeons, Atlantic City, N. J., June 16th, 17th and 18th, 1919. DR. EMIL MAYER, New York, Abstract Editor for the Association.

The meeting was opened and the President's address was read by Dr. Cornelius Coakley, New York.

The speaker quoted General Munson, in an article presented to the fifteenth annual conference of the Council of Medical Education of the American Medical Association, held in Chicago, March 3, 1919, who gives the procedure employed for the selection of the physicians who volunteered their services in the Medical Corps. He states first the manner of their selection.

After a candidate for the army had been accepted, many of them were found not to be qualified to perform the medical duties assigned to them, so that General Munson states:

"One deduction is that the general reputation of a man is not necessarily a criterion of his actual qualifications. Another, that in their estimates of each other gained by ordinary contact, physicians are not infallible. Another, that a large number of men actually practicing as specialists in this country, and generally accepted as such, are not duly qualified as the experts they are supposed to be. The latter point is one of special interest and concern to those interested in post-graduate and specialist education in this country.

"This experience would seem to carry a moral for medical educators. Have they not a field of usefulness in civil life whereby men who were originally qualified but who later deteriorated could have their deficiencies brought home to them and effectively removed?"

With these facts before him, the Surgeon-General took steps to remedy the deficiencies by two methods:

First: By farming out small squads for special instruction in a number of hospitals in the large cities. Many of these hospitals had never before been used for teaching purposes, and since the termination of the war have relapsed into their former policy of not utilizing for teaching purposes the abundant clinical material at hand.

Second: Schools of instruction for medical officers were established at several camps; these were later combined into one large school at Fort Oglethorpe, at which many of the specialties were taught. The school of oto-laryngology was in charge of Major Harris, one of our Fellows.

The training given to these medical officers was of an intensive and practical character, and it has been my privilege to talk to many who had taken it at various places, and no single student had anything but praise for the earnestness and enthusiasm of the instructors, and the highest appreciation of the great value of the instruction received. These men will all return to civil life much better medical men as a result of their army instruction.

General Munson states that 70 per cent of the alleged oto-laryngologists after the establishment of the school at Fort Oglethorpe were rejected. There is a book published purporting to give the names of those who in the United States regard themselves as specialists in diseases of the eye, ear, nose and throat. We find therein approximately 15,000 names; deducting from those number those who devote themselves solely to diseases of the eye or the ear, we have approximately 13,000 specialists in oto-laryngology who also treat the eye. If 70 per cent of this number is incompetent, it means that there are in this country about 9,000 so-called oto-laryngologists whom the War Department would not consider competent to care for soldiers. They surely are no better fitted to care for the civil population. Until this war there has never been anything before to uncover the deficiencies among oto-laryngologists. That there are such deficiencies is known to you all. That they exist in such numbers is a revelation to me. The principal reason for the incompetency of a large number of oto-laryngologists is the insufficient training acquired before the individual buys an office outfit and begins to spray noses, cut out tonsils and wash out ears. At many of the post-graduate schools a six week's course of instruction is sufficient for the granting of a certificate, which is beautifully framed and hung up in the office as testimony of the competency of the individual. The best trained men are those who have been fortunate enough to serve as internes for a year or more at one of the hospitals devoted to oto-laryngology, of which, unfortunately, there are comparatively few. These internes are usually recent graduates who have previously had an internship in surgery or medicine at a general hospital, quick to learn, enthusiastic and capable. It is probable that less than fifty such internes are graduated each year from the hospitals devoted to oto-laryngology. The wealth of clinical material and the opportunity of learning diagnosis and performing operations, both minor and major, under the supervision of the several visiting surgeons, sends their men forth with an initial training that is good and an incentive to continue in this high-grade work.

The six weeks' specialist, on the other hand, is usually a much older man, slow to learn, who never gets beyond the rudiments of our professional work. There are, of course, brilliant exceptions to this latter picture.

There are manifestly two problems for us to consider:

First: How to afford young men desirous of making oto-laryngology their life work the best facilities for doing so.

Second: How to bring up to a higher plane work done by substandard specialists.

It is far easier to plan for the first than for the second group. For the solution of either problem two things are necessary, money and time. The expense of educating an oto-laryngologist and the time required to lay the foundation are the main reasons why existing post-graduate schools have not been able to afford the kind of instruction that is desired. Well equipped laboratories, including anatomic material, an abundance of clinical facilities and a quantity of expensive short-lived modern instruments, of necessity place the cost of education at such a figure that if the cost fell solely upon the candidate few students could afford to avail them-

selves of the instruction. Our present-day post-graduate school gives all it can afford for the tuition it charges. Under-graduate schools find it costs more to educate medical students than the income from tuition. Much of the laboratory instruction of the under-graduate school may with but slight added expense be used in teaching graduates. The most economical arrangement is for the graduate school in medicine to be a part of a university and stand in the same relation to the under-graduate school in medicine as the graduate school in philosophy to the college.

The graduate school must be endowed either by individuals or the state. The schools would then be in a position to accept or reject candidates who desired to pursue any special graduate course of instruction by determining in advance whether they are qualified to receive such instruction. They would also be able at any time during the course of instruction to drop registrants for inefficient medical progress. The teaching in such an institution should be supervised by the leaders in the profession, who should have conferences and quizzes with the students and instructors at frequent stated times. The bulk of the actual teaching must be performed by the younger men who have not yet reached that stage in their professional career where their private practice occupies nearly every available minute of their time. The instructors should be adequately paid for their services. Such an association with the university would prove highly attractive to the instructors and result in bringing the best young men to the university centers, where the opportunity for research and study would be greater. If funds were provided by which any one university was able to establish a graduate school in medicine in all the specialties on the lines above indicated, it would not be long before other universities would find it necessary to seek and secure the funds to establish similar schools.

The speaker then outlined the plan of a post-graduate course of instruction in oto-laryngology combined with a laboratory and clinical course.

Those who complete such a course would be advised to spend at least one year in the interne staff of a standardized hospital, university or extramural, devoted to oto-laryngology. On the completion of the interne service in a manner satisfactory to the medical board of the hospital and on the presentation to the university authorities of a set of completed histories of all operations performed and the results obtained, the university should grant a degree.

The Prognostic Importance of Tuberculosis of the Larynx. DR. SIR ST. CLAIR THOMSON, London, England.

Tuberculosis is one of the most common and deadly scourges of humanity. There is no other which slays so many of our people in the very prime of their career, for it causes one-third of the total mortality during the chief working years of life. It kills 53,000 individuals annually in the small population of England and Wales. It is the greatest cause of disablement in adult life. It leads to more loss to the family and to the nation than any other single disease. It is one of the saddest afflictions.

At the present moment the tuberculosis question is of ever increasing urgency, for a study of statistics would tend to demonstrate that the death rate has not only ceased the steady decline it had been pursuing for many years, but that since the year 1912 it has been steadily rising.

I hold that every case of pulmonary tuberculosis and every suspected case should be examined by a skilled laryngologist, not once only, but at regularly recurring periods; every tuberculosis sanatorium should have a laryngologist on its regular staff; and every laryngologist should embrace any opportunity that may come his way of examining the throat in consumptive patients.

In a few cases tuberculosis can be diagnosed in the larynx before it has sufficiently advanced elsewhere to cause any physical signs. One such patient now under my care has been one of the allied plenipotentiaries in Paris since the beginning of the Peace Congress. Another was under observation, in and out of a sanatorium, for three whole years before my diagnosis of his laryngeal condition was confirmed by signs in his chest; he still has no bacilli. Another, a medical man, died from tuberculosis in his larynx and pharynx without a pulmonary symptom. These cases are quoted to show the responsibility which the laryngologist may have to bear in the matter of diagnosis and prognosis.

At the King Edward VII Sanatorium at Midhurst, we have a well worked system by which we obtain a report as to each patient's condition once every year after his discharge. Every case is therefore followed all the years of his life, and till his death is recorded. In our island kingdom this task is doubtless easier than on large continents, and so enables us to produce some records which other countries might have no opportunity of securing.

The after-history of 888 patients examined between July, 1911, and June, 1918, is presented in the form of tables—A and B.

They are divided into laryngeal and non-laryngeal cases and into three groups:

A patient is placed in Group 1, if the disease is limited to a small area of one or both apices; these are the slight cases. Group 2 embraces cases more extensive than Group 1, but affecting, at most, the whole of one lobe, or severe disease extending at most to the half of one lobe; such cases would still be called of slight severity. Group 3 includes all cases of greater severity than Group 2 and all those with considerable cavities; these are the more serious cases.

Looking first at Table A, the non-laryngeal cases, we note that, of course, the percentage of deaths is lowest in the cases of Group 1; that it is more than doubled in Group 2, and that in Group 3, 70 per cent are dead within seven years. Of all three groups together, and both sexes, 39.7 per cent have died within this period of observation.

Now, comparing with these results the cases in Table B—i.e., those with the larynx involved—what do we find? The first thing which strikes us is that the prognosis as shown by the percentage of deaths is rendered graver in both sexes and in all three groups.

In Group 1 the percentage rises from 15.6 to 42.9 per cent, and in Group 2 the percentage rises from 38 to 63.3 per cent. In Group 3 the increased mortality is not so striking, viz., from 70.4 to 78.3 per cent, and this is what we would expect, viz., that in advanced cases the outlook is so serious that a further addition to it is not noticeable. Taking all three groups together the presence of tuberculosis in the larynx raises the per-

centage of deaths, during the three to seven year period, from 39.7 to 68.9 per cent.

Put in other words, among all the fairly early cases of pulmonary tuberculosis admitted to a sanatorium, the expectation is that 60 per cent of them will be alive in three to seven years later. But of similar sanatorium patients with the larynx disease only 30 per cent will be alive at the end of that period.

We also note that, just as in non-laryngeal cases, the percentage of deaths in Table B is higher in Group 2 than in the early cases of Group 1 and still higher in the advanced cases of Group 3. But it is very striking to observe that the ratio of the death rate in these three groups to one another is no longer the same as in Table A; for in Group 2 the deaths are no longer about double those of Group 1, but only half as many again; and in Group 3 the frequency is only slightly in excess of the figures of Table A. Moreover, whereas in the non-laryngeal cases the death rate of the early cases of Group 1 was less than a fourth of the Group 3 cases, we see that in the laryngeal cases of Group 1 the proportion of deaths has risen to more than a half of those in Group 3. This surely shows that, even in a slight and early case of pulmonary tuberculosis—a Group 1 case—the detection of a laryngeal lesion renders the prognosis more gloomy than in a case of more advanced pulmonary infection with a free larynx. Put in another way: If a case whose pulmonary condition warrants the patient being classified in Group 1, is discovered to have a laryngeal lesion, this would at once grade him down to Group 2. It also demonstrates that in cases whose pulmonary condition would place them in Group 2, so that only 38 per cent would be dead within seven years, the involvement of the larynx lowers their prognosis to nearly that of the Group 3 cases, and 63.3 per cent will be dead within the period of observation.

As, at all stages of pulmonary tuberculosis, so much depends on the prognosis, it is sufficient if I have shown the importance of a skilled examination of the larynx. One glance into a laryngeal mirror will often show that

"a man may prophesy

With a near aim of the main chance of things

As yet not come to life."

—Henry IV, Part 2, iii, 1.

much more correctly than he can from all other clinical investigations without it.

This small investigation, after all, is only confirmatory of what we already all know. I submit it with much hesitation, not only because a satirist has said that there are three sorts of lies—lies, damned lies and statistics—but also because I am in the land where the study of statistics is almost a national talent and where the dry bones of figures are made to speak.

DISCUSSION.

THE PRESIDENT: In view of Sir St. Clair Thomson's unprecedented experience in the treatment of laryngeal tuberculosis, I would ask him what treatment is used in the King Edward Sanatorium for it.

DR. COHEN (Philadelphia): May we ask him what are the signs that define the laryngeal infections?

DR. SWAIN (New Haven): Sir St. Clair Thomson evidently can make a diagnosis of laryngeal involvements rather earlier than some of the rest of us here. We would like to have him elaborate to some extent the signs upon which he depends, outside of active ulceration, which we all recognize, for the diagnosis of tuberculosis of the larynx.

SIR ST. CLAIR THOMSON (closing): I have not enlarged on the subject of diagnosis because it is rather a large subject to enter into, and I can only say that the chief thing in diagnosis is the skilled eye of the diagnostician, because it is almost impossible to put down in words the conditions that one sees. It is not only the conditions but the slight changes of these conditions, with progress or temporary improvement. Briefly, pallor is a suggestive thing, whether pallor of the soft palate or of the epiglottis and larynx generally, though, on the other hand, particularly among men and among elderly subjects, congestion may be met with.

Then I hold a great deal in comparing very carefully with one's eye the two sides of the larynx, because if there is a congestion or a catarrh or a thickening, such as a syphilitic infiltration, it is more likely to be more or less evenly disposed on both sides, whereas, where if it is on one side, it is much more suspicious of tubercle. Then I think that the favorite spot to find an early tangible sign, what you call a physical change, is just above the vocal process, hidden to a great extent because it is low down on the laryngeal surface of the arytenoid, just where the arytenoid and the vocal process join one another. One has to see some patients several times to determine that the little hollowness there, the little solution of continuity, or a little crinkling, or a little infiltrated crinkling, is an early deposit. These are, of course, present in the later stages when there is ulceration and perichondritis—the thing is to recognize the early stages. Sometimes, of course, we have a change of voice, but I have records which will be published one day, of a considerable number of people who had no complaint of the larynx, whose voice was not changed, and yet who had distinct tuberculosis.

As to the treatment, the keynote of this is to a great extent masterly inactivity. I am quite opposed to all the violent surgery of the larynx in tuberculosis, from which we suffered chiefly through the work of Heryng, of Warsaw, and others many years ago.

In the case of these poor people that take years to die, it is impossible to herd them all into sanatoria. The thing is financially impossible. They must be sheltered as well as possible for the remaining years of their life, and in such patients to restore the voice is a very valuable thing.

Rest is the first thing. The first treatment, I think, is the sanitarium, not only because the principles of sanitarium life are so excellent, but because in the sanitarium the patient is not subject to the temptation to talk. Everything is done for him; he presses a button and makes a little sign and everybody knows what he wants, and there are other patients in the same condition, and he is distracted with their little games and walks and amusements, and not like at home, having the family hanging around him and asking him questions and luring him to talk, because vocal rest is the great thing.

I amputate the epiglottis with punch forceps generally if the dysphagia is keeping the patient from rest or dragging him down. But even there I find the use of the galvanocautery has lessened the frequency of amputation of the epiglottis. I have given up lactic acid; practically all chem-

ical caustics are found to be ineffective compared with the galvanocautery. It is the one treatment, not only for ease but for cure.

Now if the audience doesn't mind a demonstration, I think it might interest some of those who do not know if I tell you that I have brought with me a patient to show, who has been treated on these lines without the galvanocautery, and the patient stands before you. In the year 1902 I discovered that I had tuberculosis and I had a thickening of my right arytenoid and a slight abraded ulcer on the right vocal cord. I had abundant tubercle bacilli in the sputum and some hemoptysis, and I had a little cavity at the top of the right apex. I went into a sanitarium in 1902 for six months, during which six months I never spoke a word and I did another six months of what we call "an after-cure." Then I returned to work in London and for two years (which is the rule) I was very careful. I never smoked, I never went to a theater, began to do a little work, and when those two years of trial were over I went full speed ahead and have done more work since then than I ever did in my life before.

Report of a Case of Streptococcus Infection of the Larynx. DR. LIEUT.-COL. JOSEPH H. BRYAN, Washington.

B. V. E., Major, was admitted to the Walter Reed General Hospital, October 8, 1918, with double pneumonia following influenza. He was critically ill, but made a satisfactory recovery as far as his pneumonia was concerned. During his convalescence it was noticed that his voice became very husky and he complained of pain in the region of the larynx, and pain referred to the ears. He was then transferred from the Medical Service to the Ear, Nose and Throat Section. On admission to this section his voice was raucous, and there was some cough and pain in the larynx. Examination showed both tonsils hypertrophied, with some exudate from the crypts on pressure; smears showed positive streptococcus. The larynx was congested, the congestion extending well down into the trachea. There was a marked ulcerative condition noted along the free margin of the epiglottis, the free margin of the right vocal cord, over the processus vocales of the left vocal cord and near the apices of the arytenoid cartilages. The character of these secretions was unique in that the mucous membrane covering the cartilages was not actually broken through, but there was an undermining of the submucous tissue leaving marked depressions with the cup shaped and everted margins. This was especially true along the margins of the epiglottis.

Laboratory findings: Tubercle bacilli after numerous examinations not found. Streptococcus hemolyticus, the prevailing organism found in cultures from secretion from the tonsils and middle ear.

The tonsils, which may have been the primary source of the infection, were enucleated, with marked improvement in the patient's general and local condition.

After a months' furlough I saw this officer, and on examination of his larynx found the ulcerations completely healed, simply white cicatricial lines remaining. The abscess in the ear had healed and he had gained about twenty pounds in weight.

(To be continued.)

